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# **Agency Capacities to Detect and Respond to Disease Threats: Professionals' Views on Limiting Factors and Action Priorities**



(Photos: USFWS)

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This publication is one of a series of reports resulting from investigations dealing with public issues in environmental and natural resources management. The Human Dimensions Research Unit (HDRU) in the Department of Natural Resources at Cornell University studies the social and economic aspects of natural resources and the environment and the application of social and economic insights in management planning and policy. A list of HDRU publications may be obtained by writing to the Human Dimensions Research Unit, Department of Natural Resources, Fernow Hall, Cornell University, Ithaca, NY 14853, or by accessing our World Wide Web site at: <http://www2.dnr.cornell.edu/hdru>.



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## EXECUTIVE SUMMARY

In recognition of a growing need to address disease issues effectively, a National Fish and Wildlife Health Initiative (NFWHI) was developed under the leadership of the Association of Fish and Wildlife Agencies (AFWA). Proposals were sought by the U.S. Fish and Wildlife Service for research that identified areas of capacity in need of strengthening and key issues for the development and implementation of a National Fish and Wildlife Health Plan. In January 2011, Cornell University was awarded funding to conduct this research. We identified four research objectives: (1) identify state agencies' primary fish and wildlife health management concerns; (2) identify factors that can facilitate and inhibit the ability of agencies to address these concerns; (3) determine which factors are currently most limiting the effectiveness of agencies at addressing fish and wildlife health concerns; and (4) recommend strategies by which agencies can increase their capacity to address fish and wildlife health.

In this study we focused on one important facet of fish and wildlife health programs—capacities of state fish and wildlife agencies (SFWAs) to detect pathogens and respond to disease threats.

We addressed our study objectives in three phases of research over two years (2011-2012). Phase I focused on development of a conceptual framework and characterized current capacities in SFWAs. In phase two, we convened a small expert panel to elicit professional opinion on traits that would be present in SFWAs that were exemplary with regard to capacity for disease detection and response. Phase III involved personal interviews and a web-based survey to identify professional perspectives on factors limiting the capacity of SFWAs and priorities for action to address those limitations. Our assessment of agency capacities focused on both tangible factors (e.g., personnel, funding, and facilities) and intangible factors (e.g., leadership and quality of collaborative relationships). Findings from research phases I and II were reported in 2012 (Siemer et al. 2012a, 2012b, 2012c).

This report describes findings from the third and final phase of our research. We report findings from a 2012 survey of fish and wildlife professionals with responsibilities related to fish or wildlife health.

## METHODS

We designed a survey instrument to explore professional perceptions about traits and conditions that may limit the capacity of state fish and wildlife agencies (SFWAs) to address fish and wildlife health threats. Those traits and conditions fell into eight categories representing the enabling processes (i.e., legitimation, leadership, interagency coordination, management authority) and necessary resources (i.e., funding, staffing, diagnostic facilities, information base) that create institutional capacity for disease detection and response.

The questionnaire contained two sets of related questions: 27 items to assess perceptions of what factors are most limiting the effectiveness of SFWAs in addressing fish and wildlife health concerns; and 25 items to assess perceived priorities for actions to increase agency capacity.

The population of interest included SFWA employees who have professional responsibilities related to disease detection or response, as well as employees of state and federal agencies,

universities, and other organizations who may provide technical support to SFWAs on detection of disease in free-ranging fish and wildlife. We identified potential survey participants through publically-available records and referrals through the National Wildlife Health Center. We also used our 2012 qualitative interviews to identify potential survey participants (at the end of each of these interviews, we had asked interviewees to identify others in their state who should be contacted to complete a web-based survey in fall 2012). The final sample included 253 professionals.

The Survey Research Institute (SRI) of Cornell University completed survey implementation between October 15 and November 12, 2012. Data were coded and analyzed using the Statistical Package for Social Sciences (SPSS) software.

We placed categories of limiting factors in rank order according to the grand mean responses to 2-5 indicators in each category of limiting factors, and 3-5 indicators of each category of action priorities. Mean responses to items on limiting factors and agency priorities were compared between state fish and wildlife agency (SFWA) employees and respondents employed by other agencies/organizations (OA employees).

## **FINDINGS HIGHLIGHTS**

Of the 253 professionals contacted, 164 completed the questionnaire (64.8% response rate). Additionally, 8 participants partially completed the questionnaire and were included in the analysis. Respondents lived in 49 states and the District of Columbia.

Most respondents (n=116; 67%) were employed by SFWAs. The remainder (n=56) were employed by federal agencies (22%), universities (5%), nongovernmental organizations (3%), or other organizations (1%). Respondents represent a range of professional roles and responsibilities.

We assigned respondents into two groups for comparison: (1) respondents employed by SFWAs (n=116) and (2) respondents employed by all other agencies/organizations (n=56) (hereafter referred to as “OA respondents”).

### **Professionals’ perceptions of factors that limit agency capacity**

Three categories of factors were perceived as most limiting by both SFWA and OA respondents. Those factors were funding, agency legitimation, and staffing. Fifty percent or more of all respondents rated the 8 bulleted statements below as moderately or greatly limiting agency capacity.

#### *(1) Funding*

- Level of funding available for detection of and response to disease threats.
- Level of stability in funding for disease monitoring and surveillance from year to year.
- Degree to which agency funding is flexible enough to respond to emerging threats.

(2) Legitimation

- Political will to take actions that are within legal authority, but may have negative consequences for some stakeholders.
- Public support for actions that are within legal authority, but may have negative consequences for some stakeholders.

(3) Staffing

- Level of staffing available to conduct work related to disease management.
- Whether agencies have a dedicated fish and wildlife health unit that coordinates disease surveillance and agency response.
- The degree to which SFWAs have work environments that attract and retain highly-qualified staff.

In comparison to SFWA respondents, OA respondents were more likely to perceive interagency coordination as an important factor limiting agency capacity. Over 50% of OA respondents perceived that (1) SFWA participation in collaborative projects and programs, (2) interagency coordination of SFWA programs, and (3) having at least one SFWA staff member who actively participates in professional networks related to disease management were moderately to greatly limiting agency capacity.

### **Professionals' perceptions of priorities for action**

The top four categories of priorities among SFWA respondents were: funding, staffing, leadership, and interagency coordination. Fifty percent or more of SFWA respondents rated the 14 bulleted statements below as high or very high priorities for action.

(1) Funding:

- Increasing the level of funding for disease detection and response.
- Creating greater stability in funding for disease monitoring and surveillance.
- Increasing the flexibility of funding so that agencies are better able to respond to emerging threats.

(2) Staffing:

- Increasing the number of fulltime staff available to work on disease management.
- Increasing the number of agencies that have a dedicated health unit that coordinates disease surveillance and agency response.
- Improving the degree to which SFWAs have work environments that attract and retain highly-qualified staff.

(3) Leadership: Increasing the degree to which agency leaders:

- View disease management as a core component of fish and wildlife management programs.

- Advocate for adequate funding for disease management.
- Pursue necessary policy changes to maintain fish and wildlife health.
- Increase the practice of developing strategic plans for response to emerging high-risk disease threats.

(4) *Interagency coordination:*

- Increase the degree to which fish and wildlife agencies coordinate their disease management program with other agencies.
- Increase the degree to which SFWAs participate in collaborative projects and programs related to wildlife disease.
- Improve working relationships between SFWAs and other agencies.
- Increase agency use of response plans designed to coordinate multi-agency response to disease threats.

The top four categories of action priorities among OA respondents were related to: (1) *funding*; (2) *interagency coordination*; (3) *leadership*, and (4) *staffing*.

## CONCLUSIONS AND RECOMMENDATIONS

The research reported here provides a comprehensive assessment of professional’s perceptions of (1) factors that limit capacities of state fish and wildlife agencies to detect and respond to disease threats, and (2) highest priorities for agency action to increase agency capacities. Based on these professional views, we recommend a set of 14 actions that SFWAs and other organizations could take to enhance capacities of SFWAs for early detection of and coordinated response to disease threats.

*Strengthen the interagency relationships that provide a foundation for coordinated response*

- Continue to build communication networks and working relationships between SFWAs and other state and federal agencies that provide fish and wildlife-related technical expertise, services, or lead authority on domestic animal and human health threats.
- Strengthen existing and establish new inter-agency agreements (i.e., memorandums of understanding) to clarify roles of agencies involved in response to specific disease threats.

*Secure resources necessary for administration of fish and wildlife health programs*

- Diversify the funding base for disease detection and response by developing coalitions and partnerships to establish new funding mechanisms.

*Focus on developing the key components of sound program management*

- Strengthen mechanisms and processes for internal communication about the SFWA's activities related to fish and wildlife health.
- Strengthen processes for developing, or utilizing existing, state or national strategic plans for response to fish and wildlife disease threats.
- Invest in staff training related to fish and wildlife health, by sending key staff to existing training courses, or by developing local training documents and opportunities related to fish and wildlife disease detection and response.
- Support SFWA staff in their efforts to network with peers in other agencies with fish and wildlife health programs or responsibilities.
- Increase the number of SFWAs with dedicated fish/wildlife health units/programs.
- Continue to build and strengthen state, regional and national infrastructure (e.g., databases, facilities) for fish and wildlife disease monitoring and surveillance.
- Ensure funding for an active and standardized SFWA surveillance of fish and wildlife diseases.

*Take steps to cultivate and maintain public trust in SFWAs and their fish and wildlife health programs*

- Maintain processes for open communication and transparent decision making as a means to maintain the public's trust in SFWA fish and wildlife health decisions and actions.
- Support management decisions with research-based insights on stakeholders' beliefs and attitudes, patterns of behavior, and perceptions of impacts with respect to fish and wildlife disease issues.
- Deliver informative communication that improves stakeholder knowledge of issues and in turn leads to better informed input by stakeholders and better stakeholder understanding of management parameters and actions.
- Use language that stakeholders can understand, and channels of communication best suited to reach target audiences.

## ACKNOWLEDGMENTS

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Web survey layout and implementation was conducted by Cornell University's Survey Research Institute. Meghan Baumer (HDRU) provided administrative assistance throughout this project.

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## INTRODUCTION

In recognition of a growing need to address disease issues effectively, a National Fish and Wildlife Health Initiative (NFWHI) was developed under the leadership of the Association of Fish and Wildlife Agencies (AFWA). The goals of the NFWHI are to: (1) facilitate establishment and enhancement of state, federal, and territorial fish and wildlife management agency capability to effectively address health issues involving free-ranging fish and wildlife; and (2) minimize the negative impacts of health issues affecting free-ranging fish and wildlife through management, surveillance, and research (AFWA 2008:8). Proposals were sought by the U.S. Fish and Wildlife Service for research that identified areas of capacity in need of strengthening and key issues for the development and implementation of a National Fish and Wildlife Health Plan. In January 2011, the Human Dimensions Research Unit (HDRU) at Cornell University was awarded funding to conduct this research. We identified four research objectives:

- (1) Identify state agencies' primary fish and wildlife health management concerns.
- (2) Identify factors that can facilitate and inhibit the ability of agencies to address these concerns.
- (3) Determine which factors are currently most limiting the effectiveness of agencies at addressing fish and wildlife health concerns.
- (4) Recommend strategies by which agencies can increase their capacity to address fish and wildlife health.

At the outset of this project we made a decision to focus our investigation on agency capacities to detect pathogens and respond to disease threats. We chose this focus because capabilities to detect and respond to disease threats are stressed as important management needs in documents associated with NFWHI (AFWA 2008, 2010). Wildlife health experts recognize disease as only one facet of the broader concept of wildlife health (Hanisch et al. 2012). In order to keep our research within a manageable scope, we elected not to investigate professional viewpoints on agency capacity to address other threats to the health of fish and wildlife populations (e.g., spread of invasive species, exposure to toxins, habitat degradation, loss of species diversity).

We addressed study objectives in three phases of research over two years (2011-2012). Phase I focused on development of a conceptual framework and characterized current capacities in state fish and wildlife management agencies (SFWAs). In Phase II, we convened a small expert panel to elicit professional opinion on traits that would be present in SFWAs that were exemplary with regard to capacity for disease detection and response. Phase III involved personal interviews and a web-based survey to identify professional perspectives on factors limiting the capacity of SFWAs and priorities for action to address those limitations. Our assessment of agency capacities focused on both tangible factors (e.g., personnel, funding, and facilities) and intangible factors (e.g., leadership and quality of collaborative relationships). Findings from research Phases I and II were reported in 2012 (Siemer et al. 2012a, 2012b, 2012c).

The purpose of this report is to describe findings from the third and final phase of our research. We report findings from personal interviews and a survey of fish and wildlife professionals with responsibilities related to fish or wildlife disease detection or response. The research reported here is a direct continuation of work we did with a 2011 panel of fish and wildlife disease experts (Siemer et al. 2012b). It provides a comprehensive assessment of current fish and wildlife professionals' perceptions of: (1) factors that limit capacities of state fish and wildlife agencies to detect and respond to disease threats; and (2) highest priorities for state fish and wildlife agency (SFWA) action to increase agency capacities. Based on these professional views, we recommend a set of actions that SFWAs could take, individually or collectively, to enhance capacities of SFWAs to detect and respond to disease threats.

## CONCEPTUAL FOUNDATION

Because state fish and wildlife agencies are government organizations, we examined literature on capacity development in state institutions to create a theoretical foundation for our research. Institutional capacity is a concept with multiple dimensions and multiple definitions of capacity development have been advanced (Lusthaus et al. 1999). For purposes of our research the term *capacity* refers to an agency's capabilities for early detection and coordinated response to disease events. *Capacity development* refers to any system, effort or process designed to enhance those capabilities.

Capacity development literature identifies at least five internal features of agencies that play a role in institutional capacity: strategic leadership; human resources; other core resources; program and process management; and inter-institutional linkages (Lusthaus et al. 1995, 1999; Riley et al. 2003).

*Leadership* includes a broad range of formal and informal activities that establish the direction of an organization and keep it on course. Through strategic planning and direct interactions, leadership sets goals and directs staff and stakeholders toward actions that address the organization's objectives. Strategic leadership includes efforts to secure resources, motivate staff and stakeholders to perform in ways that address objectives, and help the organization adapt to external stressors in the management environment.

*Human resources* include all available agency staff who might contribute to disease detection and response capabilities. Veterinarians, pathologists, disease specialists, field biologists and technicians come to mind immediately when one thinks of disease detection capabilities. Many other types of staff may play supporting roles in detection and response programs (e.g., public affairs and communication specialists, administrators, law enforcement personnel, etc.). The number, type, and competence of staff play a crucial role in capacity of an agency. Social attributes of staff, such as the nature and extent of social networks that staff form within their agency and with peers in other agencies (e.g., social capital), are components of human resources that may contribute to learning and adaptability in organizations.

*Other core resources* essential to agency capacity include finances (e.g., level and types of program funding), technological resources (e.g., access to diagnostic facilities or equipment), and infrastructure (e.g., buildings, vehicles, communication systems). Demand for core resources

during emergence of a disease event may exceed the core resource capacity that a state agency maintains for normal operations.

*Program/process management* refers to all the processes and management activities that guide staff activities and interactions with partner agencies and organizations. These processes include: planning; problem solving; decision making; internal communications; monitoring; and evaluation. Examples of disease program management include: efforts to establish fish or wildlife health units; clearly define goals for the program; or establish communication networks.

*Inter-institutional linkages* are essential to coordinated, interagency response to disease events. Capacity depends in part on the strength of linkages between fish and wildlife agencies and sources of technical services, funding sources, agencies who share response authority, and other potential collaborators. Linkages between state fish and wildlife and agriculture agencies and between state and federal fish and wildlife agencies are recognized as a critical dimension of fish and wildlife disease management.

Although the capacity development literature identifies some of the tangible factors that determine capacity, it does not offer a framework for understanding how those factors interact as a system. To address that need, we looked to the policy learning literature for a theoretical foundation (Fiorino 2001; Glasbergen 1996; Lauber and Brown 2006; Lauber et al. 2009, 2011).

One idea that we adopted from the policy learning literature is the assertion that factors affecting capacity, including those discussed above, fall into three inter-related groups that provide the institutional foundation (e.g., interagency agreements), enabling processes (e.g., funding mechanisms), and necessary resources (e.g., funds, staff, information) for capacity development. Lauber et al. (2011) provided empirical support for this relationship of variables in a study of successful collaborative conservation initiatives. We used their findings to inform our research.

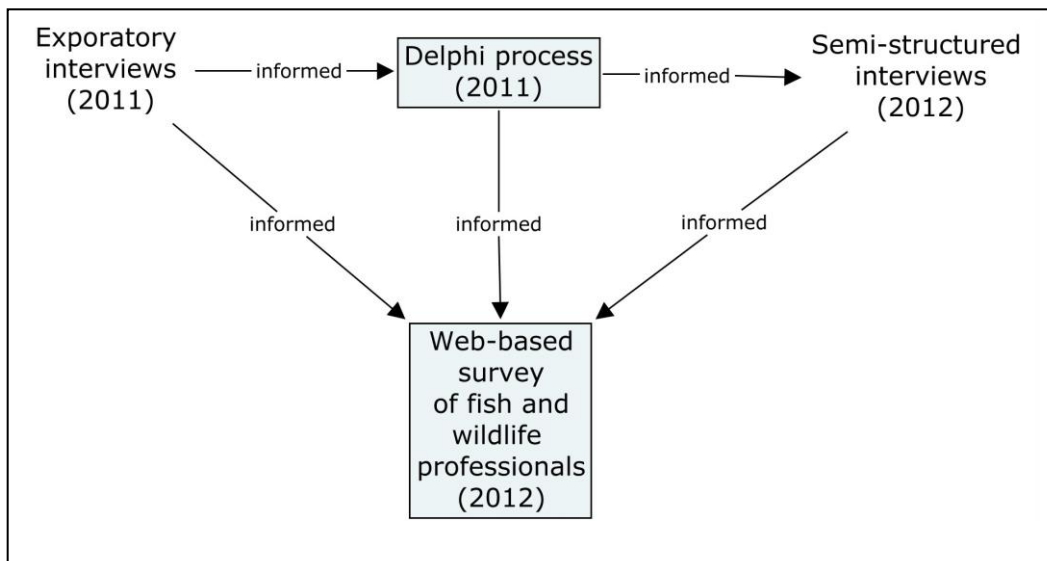
## METHODS

At the outset of this project, we identified a 4-member project advisory team to offer feedback on our research plan, help us identify agency contacts, and provide input on our draft instruments and written products. We assembled a geographically diverse team with a wealth of experience related to fish and wildlife health. Three advisory team members were from state fish and wildlife agencies, and one was from a federal natural resource agency. Two members of the team had served on the AFWA Fish and Wildlife Health Committee. We consulted with the team throughout the project to ensure that both our research questions and written results would address practical information needs of fish and wildlife agencies.

We completed data collection in four steps, over a two-year period, to characterize professional opinion on limiting factors and priorities for agency action related to detection of and response to fish and wildlife-associated disease threats (Figure 1). These steps were designed to be a recursive process, with each step informing the next and building more specific information about previously identified traits related to capacity for disease detection and response.

## Personal Interviews 2011

Our first stage of data collection was a set of exploratory interviews (n=11) with a diverse array of state and federal agency professionals who had expertise in fish and wildlife health. Subjects were identified with assistance from our project advisory team. Interviews ranged in duration from 39 to 68 minutes and were completed between March 8 and June 1, 2011. Interviews were open-ended, but followed an interview guide designed to explore areas of capacity identified in the capacity-development and policy-learning literature. Each interview was recorded and later transcribed. We used qualitative data analysis software (Atlas.ti) to code and analyze text segments, which were assigned to categories reflecting all the factors and interrelationships in our preliminary conceptual model. We used results of text analysis to validate and refine our preliminary conceptual model of capacity development. That model was described in Siemer et al. 2012a).



**Figure 1.** A summary of data collection steps used to identify and characterize professional views on factors that limit, and priorities for enhancing, state fish and wildlife agency capacities to detect and respond to aquatic and terrestrial disease threats.

## Expert Panel (Delphi) Process 2012

In order to obtain more specific information about factors influencing capacity, we engaged a panel of experts in a modified Delphi process (Dalkey and Helmer 1963, Linstone and Turoff 1975). This research method involves an iterative process of input, synthesis, and feedback (typically through surveys or workshops) among an expert group, with the purpose of moving toward agreement or consensus on the topic(s) presented to them. A typical process begins with open-ended questions to identify beliefs about the topic of interest. A process facilitator works with the group to identify these beliefs and refine them into a series of statements that are used in subsequent rounds in standardized questionnaires to identify beliefs that are widely shared

among panel members through anonymous feedback. The process often includes a final step where participants use a rating or ranking system to clarify levels of agreement on statements.

We employed the Delphi technique because it is useful as a tool for developing conceptual frameworks and theory (Okoli and Pawlowski 2004). It offered a cost-effective way to identify collective beliefs from a geographically dispersed set of subject matter experts with specialized knowledge of disease management activities within SFWAs. Variants of the technique have been used to address questions related to fish and wildlife health. Hanisch et al. (2012) convened a Delphi panel to collect expert opinion on the concept of wildlife health and the relationship of health and disease. Scotch et al. (2011) used a Delphi panel to identify questions for a survey on zoonotic disease surveillance by state agriculture and health departments.

We asked a panel of 26 panelists to provide judgments about traits SFWAs would have if they were exemplary with regard to detection and response to disease events. The process consisted of four waves of input and synthesis implemented between September 2011 and January 2012 (for a detailed methods description, see Siemer et al. 2012b).

The Delphi process identified tangible agency traits that disease experts believed had the greatest influence on capacity to detect and respond to disease threats. Panelists reached general agreement on 34 key traits of agencies in seven categories (interagency coordination, authority, leadership, funding, staffing, facilities and technology, and information acquisition). The traits considered most important for agencies to possess related to agency leadership, authority, and funding (findings from this part of the study were reported in Siemer et al. 2012b). We used findings from the Delphi process to refine our conceptual model of agency capacity to detect and respond to disease (Siemer et al. 2012b), and to inform design of our final phase of research.

### **Personal Interviews 2012**

We completed a second set of telephone interviews with fish and wildlife professionals in 2012. The objective of the interviews was to obtain insights about factors that inhibit or facilitate development of SFWA capacity for disease detection and response (i.e., address overall project objective 2). The interviews were designed to explore and refine those characteristics of agencies that we identified in the Delphi process as having an influence capacity. The information collected was used to inform the design of a subsequent web-based survey.

For this set of interviews, we contacted state agency representatives who had participated in the 2011 survey of agencies (reported in Siemer et al. 2012a). We wanted to ensure that the state agencies we contacted included both high capacity and low capacity agencies. Because high capacity agencies were fewer in number, we made a special effort to recruit representatives of these agencies. Initially, we contacted at least one representative in each state by email with an invitation participate in an interview. We used a two-tiered approach in recruiting interview respondents after these initial invitations: we contacted representatives in high capacity state fish and wildlife states first, then began contacting representatives in other state agencies (the majority of contacts for second tier interviews were with terrestrial program representatives). In 2011, we had identified 7 state agencies with high capacity on terrestrial issues and 6 with high capacity on aquatic issues (Siemer et al. 2012c). Our goal was to complete interviews with at

least 10 representatives in these self-identified high capacity state agencies, and to complete as many interviews as practical with other state agency representatives.

We ended the interview series when we reached a point of redundancy (i.e., additional interviews were yielding little new information). At that point we had completed interviews with 28 fish and wildlife professionals in 27 states. Eight of the interviews were with professionals from state agencies that self-identified as having high disease management capacity (4 in an aquatic context and 4 in a terrestrial context). The remaining 20 were with representatives of state agencies that self-identified as low capacity. We interviewed a cross section of individuals with responsibilities related to disease management, including agency administrators (6), veterinarians who were also health program leaders (7), wildlife health program leaders who were not veterinarians (11), fish culture or fish health program leaders (3), and a toxicologist (1). Interviews ranged in length from 14 minutes to 92 minutes (mean interview length 37 minutes).

We began each interview by asking subjects to offer their opinion on the extent to which their agency possessed 21 agency traits identified in the Delphi process as very or extremely important for state fish and wildlife agencies to possess. These 21 trait statements fell into 6 categories: funding; agency authority; leadership; facilities; staffing; and interagency coordination. After receiving initial responses to these questions, the interviewer asked deeper, exploratory questions about factors that influence all of the key traits in the category. For example, under leadership, the interviewer would ask, “What factors contribute to positive actions of your agency’s leadership on behalf of your fish and wildlife health program? What factors constrain positive actions...?” The interviewer listened for mention of limiting factors that had not been identified in previous research phases and asked follow-up questions when subjects touched on these factors.

Interviews were recorded and qualitative remarks were synthesized into groupings based on previously defined and emergent themes. Interview findings and findings from the Delphi process informed development of a web-based survey instrument, described in the next section.

## **2012 Web-based Survey of Professionals**

In fall 2012, we completed a web-based survey designed to explore the perceived importance of previously-identified key factors in determining the capacity of state fish and wildlife agencies to address fish and wildlife health threats.

The survey instrument (Appendix A) contained two sets of related questions. First respondents were presented with a set of 27 trait statements, and asked to indicate how much they believed that trait was limiting the collective ability of SFWAs to detect and respond to disease threats. Their response options were: not at all limiting; slightly limiting; moderately limiting; greatly limiting; and unsure. The items reflected top traits identified in the Delphi process, plus three items on additional factors identified in 2012 interviews (Appendix B).

Next, they were asked to indicate what level of priority SFWAs should place on achieving a set of 25 goals related to increasing capacity for disease detection and response. Goal statements were crafted to parallel traits described in part one of the questionnaire. The response options for

this set of items were: very low priority; low priority; moderate priority; very high priority; and unsure. Respondents were instructed to base their response on both the degree to which a lack of each trait described in the goal statements was limiting agency capacity, and how easy they believed it would be to enhance the agency traits necessary to achieve the goal.

The population of interest included SFWA employees who have professional responsibilities related to disease detection or response, as well as employees of state and federal agencies, universities, and other organizations who may provide technical support to SFWAs on detection of disease in free-ranging fish and wildlife. We identified potential survey participants through publically-available records and referrals through the National Wildlife Health Center. We also used our 2012 qualitative interviews to identify potential survey participants. At the end of each of these interviews, we asked interviewees to identify others in their state who should be contacted to complete a web-based survey in fall 2012. The final sample included 253 professionals.

The Survey Research Institute of Cornell University implemented the survey via their secure website. Each member of the sample population had a unique identification number and could only submit one completed questionnaire. Participants in the survey were contacted via e-mail. Invitation e-mails were sent out on October 15<sup>th</sup>, 2012. Cover memos indicated that the project was endorsed by AFWA. Nonrespondents received up to three reminders to complete the questionnaire. Reminder e-mails were sent to all non-respondents on October 22<sup>nd</sup>, October 29<sup>th</sup> and November 5<sup>th</sup>, 2012. Data collection ended on November 12<sup>th</sup>, 2012.

## **Analysis**

We used the Statistical Package for Social Science (SPSS) to tabulate frequencies and group means. For purposes of comparison, we placed respondents into groups based on place of employment: one group consisted of respondents employed by state fish and wildlife agencies (SFWAs); the other group consisted of respondents in other agencies and organizations.

### **Ranking categories of limitations**

Based on the mean response to each item (where 1= not at all limiting, 2=slightly limiting, 3=moderately limiting, and 4=greatly limiting), we ranked all items from 1 (for the trait which was most limiting agency capacity) to 27 (for the trait which was least limiting agency capacity). We then calculated the mean ranking for all of the items (ranging from 2 to 5 items) in each of the 8 limitations categories of traits to determine which types of traits were most limiting agency capacity.

### **Ranking categories of priorities**

Based on the group mean response (where 1= very low, 2=low, 3=moderate, 4=high, and 5=very high priority) we ranked all priority items from 1 for the item with the highest mean, to 25 for the item with the lowest mean. We averaged the ranking for all 3-5 items in a priorities category to calculate relative rankings for all categories, from 1 for the most important to 7 for the least important category.

## RESULTS

We received 164 completed questionnaires from a pool of 253 persons with valid email addresses, yielding a response rate of 64.8%. Additionally, 8 people completed part of the questionnaire and were included in the analysis. Respondents lived in 49 states and the District of Columbia.

Most respondents (n=116; 67.4%) were employed by state fish and wildlife agencies (SFWAs). The remainder (n=56; 32.6%) were employed by federal agencies (21.5%), universities (5.2%), nongovernmental organizations (2.9%), or other organizations (1.2%).

We assigned respondents into two groups for comparison: (1) respondents employed by SFWAs (n=116) and (2) respondents employed by all other agencies/organizations (n=56) (hereafter referred to as “OA respondents”). These comparisons provide insights about “insider” and “outsider” perspectives on disease management capacity within SFWAs.

Respondents represent a range of professional roles and responsibilities. Most respondents had job responsibilities that included some administration of disease-related programs and interagency communication and planning related to disease issues. Substantial minorities had responsibilities associated with disease-related diagnostic testing, research, or field work. SFWA respondents were less likely than OA respondents to have responsibilities related to disease diagnostic testing or disease-related research (Table 1).

Approximately half of respondents devoted less than 25% of their time annually to disease detection/response (Table 2). OA respondents were more likely than SFWA respondents to report devoting 50-100% of their professional time on disease detection/response (Table 2).

Most respondents (66%), including the majority of SFWA employees, had professional expertise related to fisheries and/or wildlife management (Table 3). OA respondents were much more likely than SFWA respondents to report an area of professional expertise other than fisheries or wildlife management (Table 3). Those areas of expertise included a range of fields related to fish and wildlife health (Table 4).

### **Professionals’ Perceptions of Factors that Limit Capacity**

#### **Top tier limiting factors**

Based on responses to items within each category, we calculated which categories of traits were perceived as most limiting. In both the SFWA and OA groups, funding was ranked as the most limiting category, agency legitimation was ranked second, and staffing was ranked third (Table 5).

Table 6 reports how respondents rated individual traits within each of the seven categories. Level of funding was perceived as the single greatest limitation. Thirty-six percent of SFWA respondents and 84% of OA respondents perceived funding level as greatly limiting agency capacity.

**Table 1.** Professional responsibilities related to disease management by type of employer (employed by SFWAs vs. employed by other agencies/organizations).

Area of professional expertise	Place of employment		
	State fish and wildlife agency (n=116)	Other Agency/org (n=56)	Total <sup>1</sup> (n=172)
	%	%	%
Program administration related to disease detection and response	87.9	66.1	80.8
Interagency communication and planning related to disease	78.4	78.6	78.5
Field work related to disease monitoring and surveillance	55.2	46.4	52.3
Disease diagnostic testing	36.2	53.6	41.9
Disease-related research	30.2	64.3	41.3
Field work related to prevention or control of disease	37.1	30.4	34.9

<sup>1</sup> Responses do not sum to 100% because respondents can participate in multiple activities.

**Table 2.** Percentage of time respondents dedicated to disease detection or response, by type of employer.

% of time dedicated to disease management	Place of employment		
	State fish and wildlife agency (n=116)	Other Agency/org (n=56)	Total (n=172)
	%	%	%
24% or less	59.5	33.9	51.1
25 - 49%	8.6	8.9	8.7
50-74%	11.2	17.9	13.4
75-100%	20.7	39.3	26.8

**Table 3.** Professional expertise by employer type.

Area of professional expertise	Place of employment		
	State fish and wildlife agency (n=116)	Other agency/org (n=56)	Total (n=172)
	%	%	%
Fisheries management	30.2	8.9	23.3
Wildlife management	46.6	23.2	39.0
Fisheries and wildlife management	6.0	3.6	5.2
Other	17.2	64.3	32.6

**Table 4.** Descriptions of areas of expertise other than fish and wildlife management reported by 2012 survey respondents (n=56).

	Frequency	%
Expertise related to disease detection; terrestrial context	21	37.8
Wildlife health	4	
Veterinary medicine	3	
Wildlife disease	3	
Microbiology	2	
Conservation medicine	1	
Diagnostic and research pathology - wildlife	1	
diagnostic lab	1	
Epidemiology	1	
Fish and wildlife health research	1	
Animal disease diagnostics, epidemiology	1	
Veterinary medicine and comparative pathology	1	
Wildlife disease ecology	1	
Wildlife disease investigation/management	1	
Expertise related to disease detection; aquatic context	9	16.2
Aquatic animal health	2	
Fish disease/toxicology	1	
Fish Health	1	
Fish health management	1	
Fish health research	1	
Fish pathology	2	
Aquatic animal health research	1	
Expertise related to fish culture	6	10.8
Aquaculture	2	
Fish culture	2	
Sport fish enhancement, Fish culture	1	
Fisheries and aquaculture	1	
Clinical and research expertise; taxa not specified	2	3.6
Virology	1	
Research scientist	1	
Program management	4	7.2
Program administration	1	
aquaculture permitting and fisheries management	1	
Communications	1	
Information technology	1	
Other areas of expertise	1	1.8
Wildlife damage management	1	
Not described	13	23.2
Total	56	100.0

**Table 5.** Limiting factors category means and rankings, by respondents employed by state fish and wildlife agencies (SFWAs) and those employed by other agencies/organizations.

Limiting factor category label	# items in category	SFWAs		Other agency/org	
		Category mean	(Rank)	Category mean	(Rank)
<i>Funding</i> (level, stability, flexibility)	3	3.7	1	4.0	1
<i>Legitimation</i> (political will, public support)	2	4.5	2	7.5	2
<i>Staffing</i> (staff level, health unit, work environment)	3	6.0	3	8.3	3
<i>Facilities</i> (infrastructure for routine and cutting edge monitoring and surveillance)	3	14.0	4	14.7	5
<i>Leadership</i> (related to funding, planning, policy change)	4	14.8	5	14.3	4
<i>Information acquisition</i> (quality of surveillance, internal information sharing, interagency networking)	3	19.7	6	19.7	7
<i>Interagency coordination</i> (joint planning, collaboration, coordination, communication, relationships)	5	19.8	7	18.4	6
<i>Authority</i> (to manage fish and wildlife, pass regulations, respond proactively, investigate disease events)	4	20.3	8	19.5	8

**Table 6.** Factors that 50% or more of respondents perceived as “moderately” or “greatly” limiting state fish and wildlife agency (SFWA) capacity to detect and respond to disease threats, by group (employed by SFWAs vs. employed by other agencies/organizations).

	Moderate-greatly limiting	
	<u>SFWAs</u> (n=111) %	<u>Other</u> (n=56) %
<i>Funding</i>		
Level of funding available for detection of and response to disease threats.	88	93
Level of stability in funding for disease surveillance and monitoring from year to year.	69	89
Degree to which agency funding is flexible enough to respond to <u>emerging disease threats</u> .	67	82
<i>Authority</i>		
Agency authority to respond to the threat of diseases <u>before</u> they are detected in a state.	51	71
Agency authority to promulgate regulations that reduce spread of pathogens in fish and wildlife populations.		53
<i>Leadership</i>		
Degree to which agency leaders advocate for adequate funding for fish and wildlife disease management.	57	67
Degree to which agency leaders pursue necessary policy changes to maintain fish and wildlife health.		66
Degree to which agency leaders regard fish and wildlife disease management as a core component of their agency’s program.		64
<i>Facilities</i>		
Extent to which fish and wildlife agencies have field offices, equipment, and supplies for monitoring, surveillance and other routine activities.	55	75
Degree to which agencies have <u>access to state of the art diagnostic facilities</u> necessary for sophisticated and cutting-edge diagnostic testing.		62
Degree to which agencies have <u>access to</u> diagnostic facilities and supplies necessary to conduct <u>routine</u> pathogen and disease monitoring and surveillance.		50

**Table 6.** (continued)

	Moderate-greatly limiting	
	<u>SFWAs</u> (n=111)	<u>Other</u> (n=56)
	%	%
<i>Information acquisition</i>		
Quality of fish and wildlife pathogen and disease surveillance.	53	70
<i>Staffing</i>		
<u>Level of staffing</u> available to conduct work related to pathogen and disease management.	82	87
Whether agencies have a <u>dedicated fish or wildlife health unit</u> that coordinates disease surveillance and agency response.	62	76
Degree to which fish and wildlife agencies have <u>work environments</u> that <u>attract and retain</u> highly qualified staff.	58	53
<i>Inter-agency coordination</i>		
Degree to which fish and wildlife agencies <u>coordinate</u> their disease management program with other agencies.		69
Degree to which all fish and wildlife agencies have at least one staff member <u>who actively participates in professional networks</u> that facilitate information sharing and collaboration on fish and wildlife health issues.		56
Degree to which agencies <u>participate in collaborative projects and programs</u> related to disease (e.g., cooperative monitoring and management plans).		55
<i>Legitimation</i>		
<u>Political will</u> to take actions that are within legal authority, but may have negative consequences for some stakeholders (e.g., aquaculturists, livestock producers).	72	76
<u>Public support</u> for actions that are within legal authority, but may have negative consequences for some stakeholders (e.g., aquaculturists, livestock producers).	65	64

Within the categories of funding, agency legitimation, and staffing, 50% or more of all respondents rated the 8 bulleted statements below as moderately or greatly limiting agency capacity.

Funding:

- Level of funding available for detection of and response to disease threats.
- Level of stability in funding for disease monitoring and surveillance from year to year.
- Degree to which agency funding is flexible enough to respond to emerging threats.

Legitimation:

- Political will to take actions that are within legal authority, but may have negative consequences for some stakeholders.
- Public support for actions that are within legal authority, but may have negative consequences for some stakeholders.

Staffing:

- Level of staffing available to conduct work related to disease management.
- Whether agencies have a dedicated fish and wildlife health unit that coordinates disease surveillance and agency response.
- The degree to which SFWAs have work environments that attract and retain highly-qualified staff.

**Second tier limiting factors**

Though still important, lower grand mean scores indicate that the other categories fall into a second tier of importance. The categories in this second tier included diagnostic facilities, leadership traits, information acquisition, interagency coordination, and management authority (Table 5). In comparison to SFWA respondents, OA respondents were more likely to rank leadership traits and interagency coordination as moderately or greatly limiting (Table 5).

In these second tier categories, 50% or more of all respondents rated the 4 bulleted statements below as moderately or greatly limiting agency capacity (Table 6).

Facilities:

- Extent to which fish and wildlife agencies have field offices, equipment, and supplies for monitoring and surveillance.

Leadership:

- Degree to which agency leadership advocate for adequate funding.

Information acquisition:

- Quality of fish and wildlife pathogen and disease surveillance.

Authority:

- Agency authority to respond to the threat of diseases before they are detected in a state.

## **Professionals' Perceptions of Priorities for Action**

### **Top tier priorities for agency action**

Based on responses to items within each category, we calculated which categories of traits were perceived as the highest priorities for agency action. The same four categories appear in the top four for both groups, though in a slightly different order. For SFWA respondents the top categories were improving: (1) funding; (2) staffing; (3) leadership; and (4) interagency coordination. Among OA respondents improving interagency coordination and leadership traits were ranked second and third, respectively (Table 7).

Within the categories of funding, staffing, leadership, and interagency coordination, 50% or more of all respondents rated the 14 bulleted statements below as high or very high priorities for agency action (Table 8).

Funding:

- Increasing the level of funding for disease detection and response.
- Creating greater stability in funding for disease monitoring and surveillance.
- Increasing the flexibility of funding so that SFWAs are better able to respond to emerging threats.

Staffing:

- Increasing the number of fulltime staff available in SFWAs to work on disease management.
- Increasing the number of SFWAs that have a dedicated health unit that coordinates disease surveillance and agency response.
- Improving the degree to which SFWAs have work environments that attract and retain highly-qualified staff.

Leadership: Increasing the degree to which agency leadership:

- View disease management as a core component of SFWA fish and wildlife management programs.
- Advocate for adequate funding for disease management.
- Pursue necessary policy changes to maintain fish and wildlife health in their jurisdictions.

- Increase the practice of developing state strategic plans for response to emerging high-risk disease threats.

Interagency coordination:

- Increase the degree to which SFWAs coordinate their disease management program with other state and federal agencies with fish and wildlife health programs or responsibilities.
- Increase the degree to which SFWAs participate in collaborative projects and programs related to fish and wildlife disease.
- Improve working relationships between SFWAs and other state and federal agencies with fish and wildlife health programs or responsibilities.
- Increase agency use of response plans designed to coordinate multi-agency response to disease threats.

**Second tier priorities for agency action**

Though still important, lower grand mean scores indicate that the other categories of actions fall into a second tier of priority. The categories in this second tier included: legal authority; information acquisition; and diagnostic facilities (Table 8). In comparison to SFWA respondents, OA respondents were more likely to place higher priority on addressing traits related to information acquisition and improving infrastructure and facilities for disease diagnostic testing (Table 8).

In these second tier categories, 50% or more of all respondents rated just the two bulleted statements below as a high or very high priority for agency action (Table 8).

Agency authority:

- Increase SFWA authority to promulgate regulations that reduce spread of pathogens in fish and wildlife populations.
- Increase SFWA authority to respond to the threat of pathogens and diseases before they are present in a state.

**DISCUSSION**

In this project we used a set of recursive data collection steps to identify professional's perceptions of specific traits that limit disease management capacity in state fish and wildlife agencies. Because our approach was grounded in both theory and practice, and the findings come from a multi-disciplinary sample of professionals working on issues related to fish and wildlife management and health, the work fills important information gaps and has broad uses for fish and wildlife agencies and organizations interested in improving their capacity to detect and respond to disease threats.

**Table 7.** Action priorities category means and rankings, by respondents employed by state fish and wildlife agencies (SFWAs) and those employed by other agencies/organizations.

Priorities category label	# items in factor	SFWAs		Other agency/org	
		Category mean	(Rank)	Category mean	(Rank)
<i>Funding</i> (increase level, stability, flexibility)	3	4.7	1	2.3	1
<i>Staffing</i> (increase staff level, create health units, improve work environment)	3	5.0	2	13.0	4
<i>Leadership</i> (seek funding, encourage planning, seek policy change, regard disease management as important)	4	10.3	3	12.0	3
<i>Interagency coordination</i> (increase joint planning, collaboration, coordination, communication, relationships)	5	11.6	4	9.2	2
<i>Authority</i> (to manage fish and wildlife, pass regulations, respond proactively, investigate disease events)	4	18.0	5	21.0	7
<i>Information acquisition</i> (quality of surveillance, internal information sharing, interagency networking)	3	20.3	6	15.0	5
<i>Facilities</i> (infrastructure for routine and cutting edge monitoring and surveillance)	3	21.3	7	18.7	6

**Table 8.** Factors that 50% or more of respondents perceived as high or very high action priorities to increase SFWA capacity to detect and respond to disease threats, by employer group.

	% High-very high SFWAs (n=111)	Other (n=56)
<i>Funding</i>		
Create greater stability in funding for disease surveillance and monitoring from year to year.	60	91
Increase flexibility of funding so that agencies are better able to respond to <u>emerging disease threats</u> .	59	83
Increase overall level of funding available for detection of and response to disease threats.	54	85
<i>Authority</i>		
Increase agency authority to respond to the threat of pathogens and diseases <u>before they are detected</u> in a state.	56	70
Increase agency authority to promulgate regulations that reduce spread of pathogens in fish and wildlife populations.	51	54
Increase agency authority to <u>investigate</u> fish and wildlife disease events.		50
<i>Leadership</i>		
Increase the degree to which agency leaders advocate for adequate funding for disease management.	58	83
Increase the degree to which agency leaders view disease management as a core component of fish and wildlife management programs.	56	70
Increase the degree to which agency leaders pursue necessary policy changes to maintain fish and wildlife health.	54	65
Increase the practice of developing strategic plans for response to emerging high-risk disease threats.	50	56
<i>Facilities</i>		
Increase agency <u>access to</u> diagnostic facilities and supplies necessary to conduct <u>routine</u> pathogen and disease monitoring and surveillance.		63
Increase infrastructure (e.g., field offices), equipment, and supplies for disease monitoring, surveillance and other routine activities.		57
Increase agency access to state of the art diagnostic facilities necessary for sophisticated and cutting-edge diagnostic testing.		56

**Table 8.** (continued)

	% High-very high	
	<u>SFWAs</u>	<u>Other</u>
	(n=111)	(n=56)
<i>Information acquisition</i>		
Improve quality of fish and wildlife pathogen and disease surveillance.		80
Strengthen regional and national networks to disseminate information about fish and wildlife pathogens and diseases.		70
Improve dissemination of information about fish and wildlife health from the agency's disease contact person to staff in all units within fish and wildlife agencies.		56
<i>Staffing</i>		
Improve the degree to which state fish and wildlife agencies have a work environment that attracts and retains highly qualified staff.	61	59
Increase the number of state fish and wildlife agencies that have a dedicated health unit that coordinates disease surveillance and agency response.	57	61
Increase the number of full-time equivalent staff available to conduct work related to pathogen and disease management.	56	62
<i>Inter-agency coordination</i>		
Increase the degree to which fish and wildlife agencies coordinate their disease management program with other agencies.	55	82
Increase the degree to which state fish and wildlife agencies participate in collaborative projects and programs related to wildlife disease (e.g., cooperative monitoring and management plans).	55	76
Improve working relationships between state fish and wildlife agencies and other state or federal agencies.	54	82
Increase agency use of response plans designed to coordinate multi-agency response to disease threats.		61

A key contribution of the work is identification of areas of agreement between professionals in SFWAs and those working in other agencies and organization that comprise the institutional system for fish and wildlife disease detection and response. This research identified 12 specific traits that the majority of SFWA and OA respondents regarded as moderate to great limitations on SFWA agency capacity for disease detection and response. The project also identified 16 specific actions that majorities of respondents in both groups perceive as high or very high priorities for action.

In addition, the work clarifies how professionals working within SFWAs and those working outside of SFWAs differ in their perceptions of limiting factors and priorities for action. Those differences appear to be consistent with, or expressions of, the different roles and responsibilities of professionals in the SFWA and OA respondent groups. For example, OA respondents were more likely than SFWA respondents to perceive that access to diagnostic facilities for routine monitoring and surveillance, and for state of the art diagnostic testing, were limiting SFWA fish and wildlife health capacity. They were more likely to perceive that increasing access to diagnostic facilities should be a high priority to SFWAs. OA respondents were more likely to believe that interagency coordination, collaboration, and professional networking were greatly limiting SFWA capacity. They also perceived a greater number of traits to be greatly limiting, and they believed that 24 of 25 actions described in the survey were high or very high priorities. These perspectives are consistent with the fact that a higher proportion of OA respondents specialize in fish and wildlife disease detection and research, and thus may have a richer understanding of facility and infrastructure needs, as well as other needs for capacity building. In contrast, fish and wildlife disease management was a part-time commitment for many SFWA respondents and may not have been their core area of expertise. SFWA respondents may be more involved with fish and wildlife disease management or field work than OA respondents. This may lead to a somewhat narrower perspective on limiting factors and priorities for agency action among SFWA respondents, and may help explain why SFWA respondents assigned interagency coordination a lower priority than their OA counterparts. Both perspectives are valid when considered in context, but it is important to recognize that those differences could create barriers to interagency communication. Recognizing and clarifying differences in perspective may facilitate communication (or avoid unnecessary miscommunication) between fish and wildlife health professionals working in different agencies and organizations.

### **Additional insights about the capacity building process**

The first activity we completed as part of this research was a conceptual framework describing the system of interlinked activities and processes that produce agency capacity to detect and respond to fish and wildlife disease threats. Based on literature review and insights from exploratory interviews in 2011, we adapted a model of institutional capacity developed by Lauber et al. (2011) to the context of fish and wildlife disease management. Earlier versions of that conceptual model were reported in Siemer et al. 2012a and 2012b.

Findings from the 2012 interviews and survey yielded insights that resulted in addition of new elements to the conceptual model, as well as richer description of several components described in 2012. In this section we discuss the model again, noting new insights obtained in the final phase of our research. Figure 2 represents our updated model of the process by which agencies

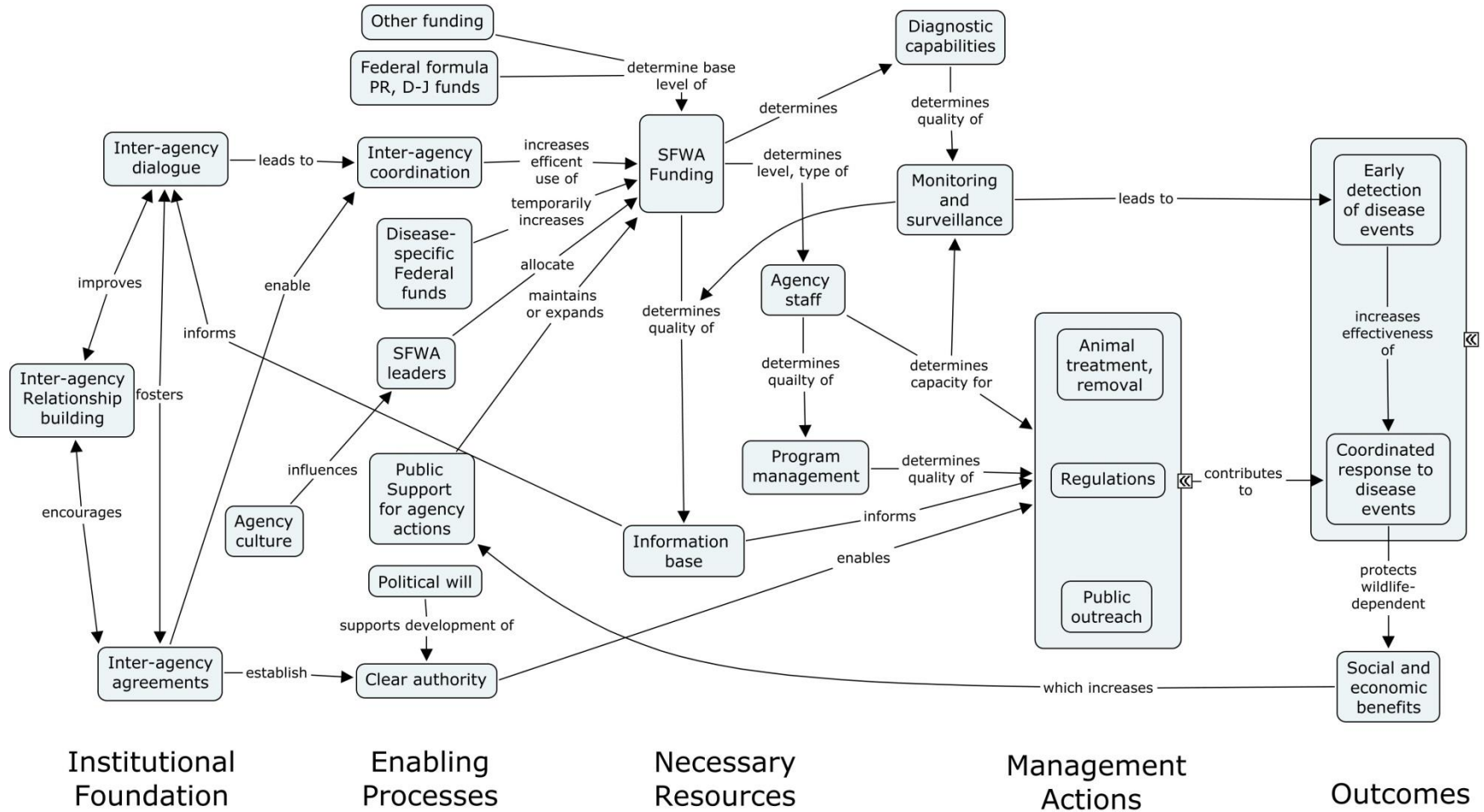
gradually develop institutional capacity to achieve early detection of and coordinated response to fish and wildlife disease threats.

### **Institutional foundation**

Our conceptualization of the institutional foundation for agency capacity was strengthened by 2012 interview findings, and we did not revise any components in this portion of Figure 2. Through a variety of partnerships and communication mechanisms (e.g., disease-specific working groups, information networks, and professional meetings), state and federal agencies with fish and wildlife health programs or responsibilities have created professional relationships and have constructed mechanisms for inter-agency dialogue. Those communication networks provide the institutional foundation for coordinated disease detection and response. Inter-agency relationships are built through a process of dialogue, and those relationships encourage formation of inter-agency fish and wildlife health agreements. Inter-agency agreements enable greater inter-agency coordination, which in turn increases efficient use of funding available to a SFWA for fish and wildlife disease detection and response. Inter-agency agreements also clarify management authority by defining specific roles that various agencies will fulfill in response to novel fish and wildlife disease threats (those roles are not defined in laws that broadly define agency authority). Our 2012 interviews reinforced the importance of personal relationships and face-to-face communication in establishing the institutional foundation for capacity development. The mechanisms for building this foundation are simple (i.e., interpersonal communication). Yet, the time demands on personnel in state and federal fish and wildlife agencies, and the bureaucratic structure of those agencies, present significant barriers to creating that communication foundation in specific states and for specific fish and wildlife health disease issues.

SFWAs can increase their disease management capacity by strengthening the interagency communication processes that create a foundation for fish and wildlife health programs. Specifically, SFWAs can follow the example of representatives we interviewed, who reported that their agency has increased its capacity for fish and wildlife disease management by:

- Participating in existing, and creating new professional networks for exchange of fish and wildlife health information;
- Developing and maintaining interpersonal relationships with fish and wildlife health peers in other agencies;
- Cultivating a positive, longstanding institutional relationship with their state department of agriculture;
- Maintaining positive, informal relationships with a range of state and federal agencies with fish and wildlife health programs or responsibilities;
- Developing a close working relationship with the college of veterinary medicine in their state; and
- Developing a close working relationship with one or more state, regional, or national disease diagnostic centers.



**Figure 2.** A conceptual model of institutional capacity building by state fish and wildlife management agencies as those agencies respond to wildlife or aquatic disease issues over multiple years.

## Enabling processes

Literature review and 2011 interview results led us to suggest that processes that enable development of capacity include: interagency coordination; funding mechanisms; establishing or clarifying management authority; and internal leadership. Findings from our 2012 interviews and survey reinforced the belief that those are key enabling processes. We also added three new enabling processes based on 2012 interview and survey findings. Those elements include: (1) organizational culture; (2) political will to take management actions; and (3) public support for potential agency actions.

*Funding mechanisms.* In every phase of our research professionals identified fish and wildlife health program funding levels as a critical factor limiting agency capacity. In most SFWAs, base funding is determined by a federal formula process based on state sales of hunting and fishing licenses. Some SFWAs have other funding sources that add to their base funding. In 2011, other specified sources included: a dedicated sales tax; revenue from fines; National Fish and Wildlife Foundation grants; other nongovernmental or state grants; Species Conservation Trust Fund; and USFWS Section 6 funds (Siemer et al. 2012a).

Temporary increases in funding occur as states are awarded funding for response to particular fish and wildlife disease outbreaks (e.g., CWD, whirling disease, VHS). In 2011 and 2012 interviews, many professionals expressed concern that federal funding for response to a few high-consequence disease threats (e.g., CWD and VHS) are expiring or will do so, and they speculated that lower federal funding for fish and wildlife disease management will be the norm in the near-term future. Many interviewees expected stable or declining levels in federal formula (P-R and D-J) funds because sales of hunting and fishing licenses are remaining stable or declining in their states.

There are three basic means by which to increase funding for fish and wildlife health programs: (1) a natural increase in the amount of funding flowing from existing mechanisms; (2) decisions by SFWA leaders to allocate a greater portion of current SFWA funding to fish and wildlife health programs; or (3) creation of new funding mechanisms. We found that agencies who self-reported as having high capacity for terrestrial disease management were more likely than those who self-reported low capacity to have multiple sources of funding for disease management (Siemer et al. 2012b).

Figure 2 notes that decisions of agency leaders about how to allocate funds to fish and wildlife health as a program area is one of the enabling processes that create agency capacity. Interviewees suggested that history of fish and wildlife disease outbreaks and agency culture influenced these decisions, with leadership showing consistency in allocation of funds to long-standing health units/programs.

*Organizational culture.* We added agency culture to our conceptual model, because interview comments suggested that organizational culture in SFWAs influences leaders' decisions about how existing SFWA funds are allocated across program areas like fish and wildlife health.

Numerous interviewees mentioned that much of their fish and wildlife disease management capacity developed in response/reaction to a disease outbreak with major economic implications. Terrestrial disease outbreaks that served as focusing events included brucellosis, epizootic hemorrhagic disease (EHD), bovine TB, and CWD. In an aquatic context, outbreaks of whirling disease, bacterial kidney disease (BKD) and VHS have served as focusing events. Agency response to these high-consequence disease threats led to development of sustained fish or wildlife health programs in that agency. Over decades, integration of fish and wildlife health programs led to changes in the SFWA's organizational culture. Agency staff who assumed leadership positions over time regarded specific aspects of fish or wildlife health as central to the agency's program, which interviewees said led to stability in funding for fish and wildlife health programs.

Some interviewees noted that normative beliefs about fish and wildlife disease management seem to be changing within SFWAs in ways that place higher professional value on fish and wildlife health. It was noted that within the past decade or so, more fish and wildlife professionals have come to view disease outbreaks as a threat to, and opportunity to better manage, fish and wildlife populations. Some Interviewees believed that agency culture is changing over time partly because new employees arrive with better understanding of fish and wildlife health issues. They speculated that recently-hired employees in their agencies were receiving more exposure to technical knowledge about fish and wildlife disease management, and had been taught that fish and wildlife health was a relevant consideration with respect to changing natural mortality rates in SFWA programs. Others noted that organizational culture changed over decades within their agency as fish and wildlife health crises unfolded in their state, and their leaders communicated that disease detection and response to disease threats were important. Our research does not provide quantitative results on SFWA culture, but does suggest that agency norms about the importance of fish and wildlife health play a role in how quickly and how extensively a given agency develops disease management capacity. Gradual changes in SFWA culture that are occurring today may lead to greater emphasis on SFWA health programs in the future.

*Political will and public support.* Figure 2 notes that management actions in response to fish and wildlife disease threats can be grouped into three broad categories: animal treatment and removal; enforcement of existing or creation of new regulations; and public outreach designed to influence human knowledge, attitudes, and behavior. Interview and survey findings both suggest that fish and wildlife health professionals recognize two important "sideboards" limiting the types of management actions that will be considered and the scale at which they would be implemented in response to disease outbreaks. Those operational sideboards are political will and public support for agency actions that are within a SFWA's authority, but may negatively affect one or more management stakeholder groups (e.g., livestock producers, aquaculturalists, hunters, anglers). For example, interviewees noted that fish and wildlife management stakeholders may become more concerned about a proposed solution to a disease outbreak (e.g., depopulation of a herd of wild or captive cervids) than they are about the direct consequences of a disease outbreak. They also noted that SFWAs may have more public trust authority to take action than would be tolerated politically.

We labeled political will and public support as facets of SFWA legitimation, because they influence whether society accepts the authority of a SFWA to take specific actions. Expressions of political will are important because they influence explicit (and perhaps implicit) levels of SFWA management authority related to specific fish and wildlife disease threats. Public support for management actions is important because it influences political will, and directly or indirectly, influences levels of SFWA funding levels. Public support will be enhanced by maintaining trust in agency decisions and actions. Political will can be generated by demonstrating that the SFWA programs provide benefits and reduce costs to the residents of a state.

*Leadership.* The topic of leadership was a recurring theme throughout this research. Professionals with responsibilities for fish and wildlife disease management seem to strongly believe that improved leadership traits are needed if SFWAs are to develop greater disease management capacity. We added an element to Figure 2 to note that SFWA leaders play a direct role in capacity levels through their decisions about how funds are allocated to fish and wildlife health programs. But fish and wildlife health professionals believe that strategic leadership is a factor that exerts influence on all levels of the capacity development process (i.e., it influences the institutional foundation, enabling processes and resources available for early detection of and coordinated response to disease threats). The degree to which such leadership is exercised will play a significant role in development of SFWA fish and wildlife health capacity.

### **Necessary resources**

In addition to funding (discussed under funding mechanisms, above), necessary resources for capacity development within SFWAs include: agency staffing; disease diagnostic facilities and technology; and information acquisition. Funding level and sources contribute to the quality of the information base, diagnostic capabilities, and staffing. Funding and staff characteristics (e.g., number, composition, skill sets, information networks) then determine the quality of the agency's fish and wildlife disease management program (i.e., program management).

Interview and survey findings from 2011 and 2012 suggest that one of the key steps in increasing disease management capacity is creating a designated fish or wildlife health unit with at least one full-time equivalent staff position. The staff member in this role would ideally be a person with: technical expertise in fish and wildlife health; high level of leadership qualities; and an ability to communicate well with technical experts, agency leaders, agency staff and the public. With respect to terrestrial disease issues, a staff veterinarian fulfills this role in some SFWAs (approximately half of all SFWAs had a veterinarian on staff in 2012).

## **RECOMMENDATIONS**

The research reported here provides a comprehensive assessment of professional's perceptions of: (1) factors that limit capacities of state fish and wildlife agencies to detect and respond to disease threats; and (2) highest priorities for agency action to increase agency fish and wildlife health capacities. Based on these professional views, we recommend a set of 14 actions that SFWAs and other organizations could take to enhance capacities of SFWAs for early detection

of and coordinated response to fish and wildlife disease threats. Several of these recommendations come directly from professionals who participated in this research.

### **Strengthen the interagency relationships that provide a foundation for coordinated response**

- Continue to build communication networks and working relationships between SFWAs and state and federal agencies that provide fish and wildlife-related technical expertise, services, or lead authority on domestic animal and human health threats. An option to support this recommendation would be implementing the recently proposed National Fish and Wildlife Health Network.
- Strengthen existing and establish new inter-agency agreements (i.e., memorandums of understanding) to clarify roles of all state and federal agencies involved in response to specific fish and wildlife disease threats and epizootic management. Memorandums of understanding between SFWAs and federal agencies (e.g., USDA APHIS Wildlife Services) for cooperative response to CWD offer example agreements.

### **Secure resources necessary for administration of fish and wildlife health programs**

- Diversify the funding base for disease detection and response by developing coalitions and partnerships to establish new funding mechanisms.

### **Focus on developing the key components of sound program management**

- Strengthen mechanisms and processes for internal communication about the SFWA's activities related to fish and wildlife health. Important mechanisms and processes include:
  - having and implementing an internal communication strategy or strategic plan;
  - having identified points of contact who will receive and pass on messages about the agency's health program;
  - and having channels for feedback from administrators and staff to the agency's health program coordinator.
- Strengthen processes for developing, or utilizing existing, state or national strategic plans for response to fish and wildlife disease threats. Example strategic plans include New York State's wildlife health program strategic plan (NYSDEC 2011) and the 2002 plan for coordinated state, federal tribal response to CWD (CWD Task Force 2002).
- Invest in staff training related to fish and wildlife health, by sending key staff to existing training courses, or by developing local training documents and opportunities related to fish and wildlife disease detection and response.
- Support SFWA staff in their efforts to network with peers in other agencies with fish and wildlife health programs or responsibilities.
- Increase the number of SFWAs with dedicated fish/wildlife health units/programs.
- Continue to build and strengthen state, regional and national infrastructure (e.g., databases, facilities) for fish and wildlife disease monitoring and surveillance.
- Ensure funding for an active and standardized SFWA surveillance of fish and wildlife diseases.

## **Take steps to cultivate and maintain public trust in SFWAs and their fish and wildlife health programs**

- Maintain processes for open communication and transparent decision making as a means to maintain the public's trust in SFWA fish and wildlife health decisions and actions.
- Support management decisions with research-based insights on stakeholders' beliefs and attitudes, patterns of behavior, and perceptions of impacts with respect to fish and wildlife disease issues (for additional discussion of stakeholder engagement, see Lauber et al. 2012).
- Deliver informative communication that improves stakeholder knowledge of issues and in turn leads to better informed input by stakeholders and better stakeholder understanding of management parameters and actions.
- Use language that stakeholders can understand, and channels of communication best suited to reach target audiences.

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## **Appendix A: Survey Instrument**



CAPACITY OF STATE AGENCIES TO DETECT AND RESPOND TO WILDLIFE-RELATED DISEASE  
THREATS

**A Survey on Capacity Building**

**Project Background**

The purpose of this survey is to identify fish and wildlife professionals' views about (1) factors that limit the capacity of state fish and wildlife management agencies to detect and respond to fish- and wildlife-related disease threats, and (2) priorities the profession should place on attaining specific goals related to building greater agency capacity in the arena of disease detection and response. Findings from this and previous phases of the project will inform recommendations on strategies for increasing disease management capacities within state fish and wildlife agencies.

This survey is being conducted by the Human Dimensions Research Unit at Cornell University, which was awarded a multistate conservation grant (#NY M 2-R), administered by the U. S. Fish and Wildlife Service (using 50% Wildlife Restoration and 50% Sport Fish Restoration funds). The Multistate Conservation Grant Program provides funding for projects identified as a priority by the Association of Fish and Wildlife Agencies (AFWA).

This survey is designed to support information needs associated with AFWA's National Fish and Wildlife Health Initiative. It is the final data collection step in a multi-faceted study that began in 2011 ( to obtain reports on completed portions of the study, contact: Bill Siemer, 202 Bruckner Hall, Department of Natural Resources, Cornell University; email:[wfs1@cornell.edu](mailto:wfs1@cornell.edu)).

**You are logged in for the first time!**

**[Continue to Survey](#)**

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CAPACITY OF STATE AGENCIES TO DETECT AND RESPOND TO WILDLIFE-RELATED DISEASE  
THREATS

How you were selected to participate in this survey: We used multiple methods to identify professionals to approach about participating in this survey. Your name was identified through one of those processes.

In the summer of 2011, the National Wildlife Health Center circulated a request to release contact information to Cornell University for the purpose of conducting this research project. Contacts in most states agreed to allow release of their email address for this purpose. As professionals participated in this project, we asked them to suggest names of colleagues who they believed should be included in the research. This included individuals in other agencies, universities and nongovernmental organizations.

To identify fisheries professionals, we used a publically-available NASAC-APHIS directory of state agency contacts.

Federal agencies play roles in creating disease-management capacity in state fish and wildlife agencies. We worked with representatives of several agencies (e.g., USDA-APHIS, USGS National Wildlife Health Center, NOAA), who identified selected professionals in their agencies we could contact about study participation. We also obtained contact information from publically-available listings of federal fisheries and wildlife health laboratories.

Confidentiality: Your contact information will not be used for any purpose other than correspondence about this study and release of project reports. Survey results will be reported in aggregate and respondent identities will remain confidential.

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CAPACITY OF STATE AGENCIES TO DETECT AND RESPOND TO WILDLIFE-RELATED DISEASE  
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**Guidelines to consider as you complete the Questionnaire**

- Responses should reflect your professional opinions and experiences; you do not need to represent any agency or organization.
- Throughout the questionnaire, the word "disease" refers broadly to pathogen or disease threats affecting or associated with fish and wildlife.
- Throughout the questionnaire, the phrase "detecting disease threats" refers broadly to detecting presence of fish and wildlife diseases or pathogens associated with fish and wildlife diseases.
- All questions focus on characteristics that may limit the collective capacity of state fish and wildlife management agencies to detect and respond to disease threats. It is recognized that other state and federal agencies play roles in creating capacity in state fish and wildlife agencies.
- At any time you can contact Bill Siemer at Cornell University (607.255.2828; email [wfs1@cornell.edu](mailto:wfs1@cornell.edu)) if you need clarification about a specific question.

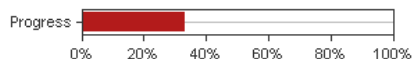
**Thank You!**

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### Section 1: Your Professional Traits

Items in this section request information about your professional background and your experiences related to management of fish and wildlife diseases. Your answers will help us understand how the perspectives of professionals relate to their roles and responsibilities related to disease management.

[q1] Which of the following best describes your place of employment?

- State fish and/or wildlife management agency
- Other state agency
- Federal agency
- University
- Nongovernmental organization
- Other

[q2] What is your job/position title?

[q3] What is your area of professional expertise?

- Fisheries management
- Wildlife management
- Fisheries and Wildlife management
- Other

[q4] Approximately what proportion of your time do you devote to fish and/or wildlife disease detection or response in a typical year?

- 0%
- 1-24%
- 25-49%
- 50-74%
- 75-99%
- 100%

Which of the following activities do you engage in as part of your professional responsibilities related to disease detection and response? *(Please check all that apply.)*

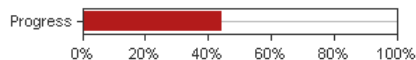
- [q5a] Program administration related to disease detection and response
- [q5b] Field work related to disease monitoring and surveillance
- [q5c] Field work related to prevention or control of disease
- [q5d] Disease diagnostic testing
- [q5e] Disease-related research
- [q5f] Interagency communication and planning related to disease detection and response

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## Section 2: Factors Limiting the Capacity of State Fish and Wildlife Agencies to Detect and Respond to Disease

Early this year, a panel of 21 fish and wildlife professionals identified characteristics that they believed would be present in state fish and wildlife agencies with high capacity to detect and respond to disease threats. Those characteristics are described in the following sets of questions.

In this section, we seek your professional judgment about the degree to which the following agency characteristics are currently limiting the collective capacity of state fish and wildlife agencies to detect and respond to disease threats.

**Please read each item. Then fill in the circle that indicates how much you think each characteristic is limiting the collective ability of state fish and wildlife agencies to detect and respond to disease threats. (Fill in one circle for each question. Base your answers on your knowledge about the state fish and wildlife agencies with which you are most familiar. If you work in a state fish and wildlife agency, respond based on your understanding of agencies generally, not just the agency in which you work.)**

*Example: One agency characteristic might be, "Access to cutting edge diagnostic facilities." If you think that current agency access to such facilities is limiting agency capacity to detect and respond to disease threats, you would select "moderately" or "greatly" limiting.*

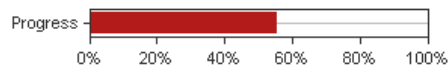
**How much these characteristics are currently limiting fish and wildlife agency capacity to manage disease threats**

<b>Characteristics of state fish and wildlife agencies</b>	<b>Not at all limiting</b>	<b>Slightly limiting</b>	<b>Moderately limiting</b>	<b>Greatly limiting</b>	<b>Unsure</b>
[q6a] Level of funding available for detection of and response to disease threats.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
[q6b] Degree to which agency funding is flexible enough to respond to <u>emerging disease threats</u> .	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
[q6c] Level of stability in funding for disease surveillance and monitoring from year to year.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
[q6d] Agency authority to manage or control fish and wildlife populations as necessary to address disease risks.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
[q6e] Agency authority to promulgate regulations that reduce spread of pathogens in fish and wildlife populations.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
[q6f] Agency authority to respond to the threat of diseases <u>before</u> they are detected in a state.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
[q6g] Agency authority to investigate fish and wildlife disease events.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
[q6h] Degree to which agency leaders regard fish and wildlife disease management as a core component of their agency's program.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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Section 2: Factors Limiting the Capacity of State Fish and Wildlife Agencies to Detect and Respond to Disease (continued)

*How much these characteristics are currently limiting fish and wildlife agency capacity to manage disease threats*

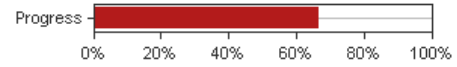
<b>Characteristics of state fish and wildlife agencies</b>	<b>Not at all limiting</b>	<b>Slightly limiting</b>	<b>Moderately limiting</b>	<b>Greatly limiting</b>	<b>Unsure</b>
[q6i] Degree to which agency leaders advocate for adequate funding for fish and wildlife disease management.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
[q6j] Degree to which agency leaders pursue necessary policy changes to maintain fish and wildlife health	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
[q6k] Degree to which agency leaders encourage development of plans for response to emerging high-risk disease threats.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
[q6l] Extent to which fish and wildlife agencies have field offices, equipment, and supplies for monitoring, surveillance and other routine activities.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
[q6m] Degree to which agencies have <u>access to</u> diagnostic facilities and supplies necessary to conduct <u>routine</u> pathogen and disease monitoring and surveillance.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
[q6n] Degree to which agencies have <u>access to state of the art diagnostic facilities</u> necessary for sophisticated and cutting-edge diagnostic testing.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
[q6o] Quality of regional and national networks to disseminate information about fish and wildlife pathogens and diseases.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
[q6p] Quality of fish and wildlife pathogen and disease surveillance.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
[q6q] Degree to which information about fish and wildlife health is disseminated to all units within fish and wildlife agencies	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
[q6r] <u>Level of staffing</u> available to conduct work related to pathogen and disease management.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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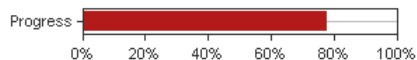
CAPACITY OF STATE AGENCIES TO DETECT AND RESPOND TO WILDLIFE-RELATED DISEASE THREATS



Section 2: Factors Limiting the Capacity of State Fish and Wildlife Agencies to Detect and Respond to Disease (continued)

<b>Characteristics of state fish and wildlife agencies</b>	<b>How much these characteristics are currently limiting fish and wildlife agency capacity to manage disease threats</b>				
	<b>Not at all limiting</b>	<b>Slightly limiting</b>	<b>Moderately limiting</b>	<b>Greatly limiting</b>	<b>Unsure</b>
[q6s] Whether agencies have a <u>dedicated fish or wildlife health unit</u> that coordinates disease surveillance and agency response.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
[q6t] Degree to which fish and wildlife agencies have <u>work environments</u> that <u>attract and retain</u> highly qualified staff.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
[q6u] Degree to which agencies <u>follow response plans</u> designed to coordinate multi-agency response to disease threats.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
[q6v] Degree to which agencies <u>participate in collaborative projects and programs</u> related to disease (e.g., cooperative monitoring and management plans).	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
[q6w] Degree to which fish and wildlife agencies <u>coordinate</u> their disease management program with other agencies.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
[q6x] Degree to which all fish and wildlife agencies have at least one staff member <u>who actively participates in professional networks</u> that facilitate information sharing and collaboration on fish and wildlife health issues.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
[q6y] <u>Political will</u> to take actions that are within legal authority, but may have negative consequences for some stakeholders (e.g., aquaculturists, livestock producers).	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
[q6z] <u>Public support</u> for actions that are within legal authority, but may have negative consequences for some stakeholders (e.g., aquaculturists, livestock producers).	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
[q6aa] <u>Quality of working relationships</u> between state fish and wildlife agencies and other state or federal agencies with disease management authority.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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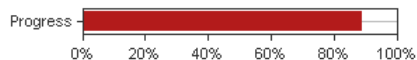


### Section 3: Priorities for Increasing the Capacity of State Fish and Wildlife Agencies to Detect and Respond to Disease

One way to increase disease management capacity in state fish and wildlife management agencies would be to take actions to enhance the characteristics described in the previous questions. Decisions about which traits to try to enhance would be based on both the degree to which a lack of each trait is limiting capacity and how easy it is to enhance each trait. In your professional view, what level of priority should fish and wildlife agencies place on achieving the following goals?

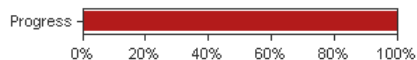
<b>Potential goals of efforts to increase state fish and wildlife agency capacity for disease management</b>	<b>Priority level agencies should place on achieving this goal</b>					
	Very low	Low	Moderate	High	Very high	Unsure
[q7a] Increase overall level of funding available for detection of and response to disease threats.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
[q7b] Increase flexibility of funding so that agencies are better able to respond to <u>emerging disease threats</u> .	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
[q7c] Create greater stability in funding for disease surveillance and monitoring from year to year.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
[q7d] Increase agency authority to manage or control fish and wildlife populations as necessary to address disease risks.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
[q7e] Increase agency authority to promulgate regulations that reduce spread of pathogens in fish and wildlife populations.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
[q7f] Increase agency authority to respond to the threat of pathogens and diseases <u>before</u> they are detected in a state.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
[q7g] Increase agency authority to <u>investigate</u> fish and wildlife disease events.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
[q7h] Increase the degree to which agency leaders view disease management as a core component of fish and wildlife management programs.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
[q7i] Increase the degree to which agency leaders advocate for adequate funding for disease management.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
[q7j] Increase the degree to which agency leaders pursue necessary policy changes to maintain fish and wildlife health.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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Section 3: Priorities for Increasing the Capacity of State Fish and Wildlife Agencies to Detect and Respond to Disease (continued)

<i>Potential goals of efforts to increase state fish and wildlife agency capacity for disease management</i>	<i>Priority level agencies should place on achieving this goal</i>					
	Very low	Low	Moderate	High	Very high	Unsure
[q7k] Increase the practice of developing strategic plans for response to emerging high-risk disease threats.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
[q7l] Increase infrastructure (e.g., field offices), equipment, and supplies for disease monitoring, surveillance and other routine activities.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
[q7m] Increase agency <u>access to</u> diagnostic facilities and supplies necessary to conduct <u>routine</u> pathogen and disease monitoring and surveillance.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
[q7n] Increase agency <u>access to state of the art diagnostic facilities</u> necessary for sophisticated and cutting-edge diagnostic testing.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
[q7o] Strengthen regional and national networks to disseminate information about fish and wildlife pathogens and diseases.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
[q7p] Improve quality of fish and wildlife pathogen and disease surveillance.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
[q7q] Improve dissemination of information about fish and wildlife health from the agency's disease contact person to staff in all units within fish and wildlife agencies.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
[q7r] Increase the number of full-time equivalent staff available to conduct work related to pathogen and disease management.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
[q7s] Increase the number of state fish and wildlife agencies that have a dedicated health unit that coordinates disease surveillance and agency response.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
[q7t] Improve the degree to which state fish and wildlife agencies have a work environment that attracts and retains highly qualified staff.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
[q7u] Increase agency use of response plans designed to coordinate multi-agency response to disease threats.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



Section 3: Priorities for Increasing the Capacity of State Fish and Wildlife Agencies to Detect and Respond to Disease (continued)

Potential goals of efforts to increase state fish and wildlife agency capacity for disease management	Priority level agencies should place on achieving this goal					
	Very low	Low	Moderate	High	Very high	Unsure
[q7v] Increase the degree to which state fish and wildlife agencies participate in collaborative projects and programs related to wildlife disease (e.g., cooperative monitoring and management plans).	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
[q7w] Increase the degree to which fish and wildlife agencies coordinate their disease management program with other agencies.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
[q7x] Increase the ability of key staff in fish and wildlife agencies to network with peers to share information and collaborate in disease management issues.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
[q7y] Improve working relationships between state fish and wildlife agencies and other state or federal agencies.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

[q8] Please use the following space for any questions or comments you wish to make on the topic of capacity of state fish and wildlife agencies to manage wildlife disease outbreaks.

Previous
Submit Survey
  
Finish Later

If you have questions or require technical assistance with this survey, please [email](#) the Survey Research Institute or call 1-888-367-8404.



Thank you for taking the time to complete this survey.

Your survey has been submitted, please close your browser.

If you have questions or require technical assistance with this survey, please [email](#) the Survey Research Institute or call 1-888-367-8404.

## Appendix B: Questionnaire item wording

**Table B 1.** Wording of items to assess agency limitations in the fall 2012 survey of fish and wildlife professionals.

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### *Funding*

- 6a. Level of funding available for detection of and response to disease threats.
- 6b. Degree to which agency funding is flexible enough to respond to emerging disease threats.
- 6c. Level of stability in funding for disease surveillance and monitoring from year to year.

### *Authority*

- 6d. Agency authority to manage or control fish and wildlife populations as necessary to address disease risks.
- 6e. Agency authority to promulgate regulations that reduce spread of pathogens in fish and wildlife populations.
- 6f. Agency authority to respond to the threat of diseases before they are detected in a state.
- 6g. Agency authority to investigate fish and wildlife disease events.

### *Leadership*

- 6h. Degree to which agency leaders regard fish and wildlife disease management as a core component of their agency's program.
- 6i. Degree to which agency leaders advocate for adequate funding for fish and wildlife disease management.
- 6j. Degree to which agency leaders pursue necessary policy changes to maintain fish and wildlife health.
- 6k. Degree to which agency leaders encourage development of plans for response to emerging high-risk disease threats.

### *Facilities*

- 6l. Extent to which fish and wildlife agencies have field offices, equipment, and supplies for monitoring, surveillance and other routine activities.
  - 6m. Degree to which agencies have access to diagnostic facilities and supplies necessary to conduct routine pathogen and disease monitoring and surveillance.
  - 6n. Degree to which agencies have access to state of the art diagnostic facilities necessary for sophisticated and cutting-edge diagnostic testing.
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**Table B 1.** (continued)

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*Information acquisition*

6o. Quality of regional and national networks to disseminate information about fish and wildlife pathogens and diseases.

6p. Quality of fish and wildlife pathogen and disease surveillance.

6q. Degree to which information about fish and wildlife health is disseminated to all units within fish and wildlife agencies

*Staffing*

6r. Level of staffing available to conduct work related to pathogen and disease management.

6s. Whether agencies have a dedicated fish or wildlife health unit that coordinates disease surveillance and agency response.

6t. Degree to which fish and wildlife agencies have work environments that attract and retain highly qualified staff.

*Inter-agency coordination*

6u. Degree to which agencies follow response plans designed to coordinate multi-agency response to disease threats.

6v. Degree to which agencies participate in collaborative projects and programs related to disease (e.g., cooperative monitoring and management plans).

6w. Degree to which fish and wildlife agencies coordinate their disease management program with other agencies.

6x. Degree to which all fish and wildlife agencies have at least one staff member who actively participates in professional networks that facilitate information sharing and collaboration on fish and wildlife health issues.

6aa. Quality of working relationships between state fish and wildlife agencies and other state or federal agencies with disease management authority.

*Legitimation*

6y. Political will to take actions that are within legal authority, but may have negative consequences for some stakeholders (e.g., aquaculturists, livestock producers).

6z. Public support for actions that are within legal authority, but may have negative consequences for some stakeholders (e.g., aquaculturists, livestock producers).

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**Table B 2.** Wording of items to assess agency priorities in the fall 2012 survey of fish and wildlife professionals.

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*Funding*

7a. Increase overall level of funding available for detection of and response to disease threats.

7b. Increase flexibility of funding so that agencies are better able to respond to emerging disease threats.

7c. Create greater stability in funding for disease surveillance and monitoring from year to year.

*Authority*

7d. Increase agency authority to manage or control fish and wildlife populations as necessary to address disease risks.

7e. Increase agency authority to promulgate regulations that reduce spread of pathogens in fish and wildlife populations.

7f. Increase agency authority to respond to the threat of pathogens and diseases before they are detected in a state.

7g. Increase agency authority to investigate fish and wildlife disease events.

*Leadership*

7h. Increase the degree to which agency leaders view disease management as a core component of fish and wildlife management programs.

7i. Increase the degree to which agency leaders advocate for adequate funding for disease management.

7j. Increase the degree to which agency leaders pursue necessary policy changes to maintain fish and wildlife health.

7k. Increase the practice of developing strategic plans for response to emerging high-risk disease threats.

*Facilities*

7l. Increase infrastructure (e.g., field offices), equipment, and supplies for disease monitoring, surveillance and other routine activities.

7m. Increase agency access to diagnostic facilities and supplies necessary to conduct routine pathogen and disease monitoring and surveillance.

7n. Increase agency access to state of the art diagnostic facilities necessary for sophisticated and cutting-edge diagnostic testing.

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**Table B 2.** (continued)

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*Information acquisition*

7o. Strengthen regional and national networks to disseminate information about fish and wildlife pathogens and diseases.

7p. Improve quality of fish and wildlife pathogen and disease surveillance.

7q. Improve dissemination of information about fish and wildlife health from the agency's disease contact person to staff in all units within fish and wildlife agencies.

*Staffing*

7r. Increase the number of full-time equivalent staff available to conduct work related to pathogen and disease management.

7s. Increase the number of state fish and wildlife agencies that have a dedicated health unit that coordinates disease surveillance and agency response.

7t. Improve the degree to which state fish and wildlife agencies have a work environment that attracts and retains highly qualified staff.

*Inter-agency coordination*

7u. Increase agency use of response plans designed to coordinate multi-agency response to disease threats.

7v. Increase the degree to which state fish and wildlife agencies participate in collaborative projects and programs related to wildlife disease (e.g., cooperative monitoring and management plans).

7w. Increase the degree to which fish and wildlife agencies coordinate their disease management program with other agencies.

7x. Increase the ability of key staff in fish and wildlife agencies to network with peers to share information and collaborate in disease management issues.

7y. Improve working relationships between state fish and wildlife agencies and other state or federal agencies.

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