



USGS National Wildlife Health Center Strategic Science Plan: Advancing Wildlife and Ecosystem Health for the Next Decade



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Introduction

The National Wildlife Health Center (NWHC) was founded in 1975 to consolidate U.S. Fish and Wildlife expertise into a single program designed to provide the technical assistance necessary to identify, control, and prevent wildlife losses from diseases as well as conduct research to understand the impact of diseases on wildlife populations, and devise methods to more effectively manage these disease threats. The impetus behind the creation of the NWHC was, in part, a consequence of the catastrophic loss of tens of thousands of waterfowl as a result of an outbreak of duck plague at the Lake Andes National Wildlife Refuge in South Dakota. In 1996, the NWHC, along with other Department of Interior research functions was transferred to the U.S. Geological Survey (USGS), where we remain one of many entities that provide the independent science that forms the bases of the sound management of the Nation's natural resources.

The main campus of the NWHC is located in Madison, Wisconsin where we maintain biological safety level 3 (BSL-3) diagnostic and research facilities purposefully designed to work with wildlife species. The NWHC provides research and technical assistance on wildlife health issues to federal, state, Tribal and other agencies as well as internationally. In addition, since 1992 we have maintained a field station in Hawaii (Honolulu Field Station) that focuses on terrestrial and marine natural resources throughout the Pacific region.

There are an increasing number of emerging infectious diseases, and many of the diseases that are threats to wildlife, human and ecosystem health are of wildlife origin. The impacts of these diseases are global and profound, often resulting in increased burden on the public health system, economic losses, declines in wildlife populations, and subsequent ecological disturbances. Furthermore, wildlife populations are increasingly vulnerable to disease events due to the lethal and sublethal effects of contaminants, decreased genetic diversity and other factors, such as habitat loss, that reduce population resilience.

The NWHC and other institutions and agencies have responded to these diseases by conducting research, disease investigations, surveillance and management activities to address these threats. However, in order to increase the success of wildlife disease management there is a need to take a more proactive approach. To better protect this Nation's natural resources from emerging disease threats we need greater understanding of the causes and drivers of these emerging diseases, and to identify and understand the underlying factors that enhance disease risks. Several important questions remain, for example, what are the root causes that underpin pathogen emergence, evolution, establishment and persistence? What are the future high-impact or transboundary wildlife diseases that threaten North America? Can we predict the next emerging disease? Can we identify regions in North America where emerging diseases will most likely originate? What are the high risk species? What tools are needed to address disease issues, especially in challenging ecosystems like oceans, or arctic environments?

To meet these challenges the NWHC has embarked upon an ambitious strategic planning process to guide our work and activities for the next 3-5 years so we can meet our responsibilities to be ever vigilant for the next emerging disease, and provide the exceptional science needed to understand and manage these disease threats in a timely and effective manner. The outcomes that result from this plan will form the foundation of our work for the next decade.

Science and Strategic Planning Committee

An internal committee consisting of staff members from various Branches and areas of the NWHC was formed to develop the strategic plan. The committee was charged with revising the mission statement, developing core values, guiding principles for how we work and interact, science goals, and ultimately a strategic implementation plan. The committee has met weekly since its inception in September 2010, and has been assisted by a management consultant. The committee has regularly consulted NWHC staff, both formally during meetings and a day-retreat as well as informally. The committee also used material from previous staff and partner satisfaction surveys as well as the outcome of an independent panel of infectious disease experts who were invited to the NWHC to review our science and science management and provide recommendations for future work.

This Strategic Science Plan is a culmination of this collaborative process, and will be used to guide and prioritize our work into the future. This plan charts a course for the future direction of the NWHC, and builds upon our past successes, collaborations, and unique facilities to ensure we conduct exceptional science that meets and exceeds the expectations of our partners, and utilizes the full potential and expertise of our staff. The wildlife disease issues we face are increasingly complex, and this plan will ensure we have the skills, tools, resources and partnerships to meet the needs of those we serve and help protect the Nation's natural resources. Furthermore, while the USGS science plans are currently in development, we anticipate the scientific work outlined in this plan will be consistent with the priority science for several USGS Mission Areas, including Ecosystems, Environmental Health, Natural Hazards, and possibly others.

The Plan

The plan is divided into three equally important strategic science goals with a preamble to each goal. The goals describe the overall vision or purpose to which our endeavors will be directed. The goals are then divided into objectives and strategies. The objectives describe the ends towards which our efforts and actions will be directed, and the strategies describe how we will achieve these objectives and goals. For each strategy there are sections on why it is important, what will be done and when it will be done or initiated. Subsequent to this science plan, implementation plans will be developed that will outline how the plan will be executed, i.e., the specific actions that will be done to deliver on the strategies and what tactics will be used to achieve the goals.

Mission of the National Wildlife Health Center

Our mission is to provide national leadership to safeguard wildlife and ecosystem health through dynamic partnerships and exceptional science.

Our motto is *advancing wildlife and ecosystem health*.

Core Values

Inspiration: We recognize that the health of wildlife is vital to the sustainability of the Earth's ecosystems.

Leadership: Our national scope and breadth of expertise provide us with the strength to be a leader in promoting the importance of wildlife and ecosystem health, bringing it to the forefront of national consciousness.

Partnerships: We recognize the power of partnerships and actively seek and foster collaboration in all our activities. Our work is guided by the diverse needs and challenges of those we serve who are responsible for the stewardship of our Nation's wildlife and ecosystems.

Integrity: We hold ourselves to the highest standards to produce quality science in a transparent manner that will inform managers and policy decision-makers.

Innovation: We meet the difficult challenges of our work with creativity and passion, generating innovative solutions to complex problems.

Culture: Recognizing our employees as our foundation, we strive to provide a safe, supportive, and respectful environment that values teamwork and diversity of thought.

Guiding Principles

Leadership

- We are all leaders

Responsibility and Integrity

- Aim for the highest quality of work in all that you do
- Make the difficult decisions and be consistent
- Stand behind your word
- Willingly accept redirection according to Center needs
- Be willing to accept new responsibilities
- Respond to colleagues and partners in a timely manner

Respect

- Actively listen
- Be polite when expressing your thoughts
- Acknowledge that we all have time constraints
- Foster a culture of work-life balance
- Be open to input and receptive to questions, thoughts, and insights of others
- Admit your own mistakes
- Realize that mistakes will be made and that people are acting with best intentions

Teamwork/Collaboration

- We work as a team for the benefit of the Center and our science
- Support decisions and strategic objectives
- Create a safe environment for open communication
- Communicate frequently and clearly
- Support each other
- Recognize each other's strengths and work to complement each other's skills and talents
- Use respectful disagreement as an opportunity for growth
- Check your assumptions and opinions against the facts

Creativity/Resourcefulness

- Find solutions for difficult problems
- Encourage innovations and collaborations
- Do quality science in the face of changing demands
- Be willing to take risks

Science Goals

GOAL 1

Serve as a catalyst to establish a collaborative North American Wildlife Health Strategy (NAWHS) that creates an operational framework to address the most pressing wildlife health issues. This NAWHS will emphasize the importance of a collaborative approach to mitigate the impact of wildlife diseases and other stressors on wildlife, domestic animal, and human health.

Preamble

The increasingly severe consequences of wildlife diseases and the multiple impacts across society will require close intersectoral, multidisciplinary partnerships to address these issues of mutual concern. The One Health concept, which recognizes that human and animal health are interconnected within the context of ecosystem health, provides a theoretical model by which to address these issues. This NAWHS aims to provide an operational framework by which institutions with a stake in wildlife health will cooperate and collaborate to achieve optimal outcomes for wildlife, human, domestic animal and ecosystem health.

The overarching aim of the NAWHS is to build a collaborative framework by which Department of Interior (DOI) agencies, along with other federal, state and Tribal agencies, and key wildlife health professionals in U.S., Canada and Mexico will operate and make informed management and policy decisions based on sound scientific evidence through better coordination, collaboration and responsibility sharing.

1.1 - Objective 1: Develop a network of partners for coordinating investigation, research, surveillance, response and reporting of endemic and emerging wildlife diseases.

1.1.1 - Strategy 1: Develop a collaborative Wildlife Health Working Group of key partners that represents diverse perspectives on wildlife health.

Why is this important?

Unlike human and domestic animal health, there is currently no recognized organizational framework by which federal and state/provincial agencies operate together to address wildlife health issues in a “One Health” context. This Wildlife Health Working Group will establish the partnerships needed to proactively develop operational strategies to address wildlife disease issues and other stressors on wildlife, domestic animal, and human health. Promotion of data and information sharing and more frequent interaction with the One Health community will be achieved through these partnerships.

What will be done?

Initially, we will work with other entities within DOI that have a stake in wildlife health to:

- Develop a Department communication structure for reporting and sharing information about wildlife and zoonotic disease issues.
- Develop a Department plan and incident command structure for responding to wildlife disease emergencies of significant magnitude.

Building on our initial work within DOI, we will facilitate the formation of a Wildlife Health Working Group that includes federal, state and Tribal agencies, and key wildlife health professionals in the US, Canada and Mexico. To the extent possible, we will work within existing organizational structures including Association of Fish and Wildlife Agencies, United States Animal Health Association, and other groups within the wildlife, and health communities to:

- Facilitate the development and implementation of the NAWHS.
- Develop interagency agreements or memoranda of understanding with appropriate agencies for a coordinated response to wildlife and wildlife-associated zoonotic disease emergencies.
- Develop response plans to address outbreaks of disease in wildlife species and for evaluating the success of disease control measures.
- Develop reporting and data sharing partnerships for the rapid exchange of information about wildlife and wildlife-associated zoonotic disease outbreaks in North America.

When will it be accomplished?

The Wildlife Health Working Group will be established by 2013. The activities of this group outlined above will then be initiated and remain ongoing.

1.1.2 - Strategy 2: Strengthen international partnerships, especially within North America (Canada and Mexico), and work collaboratively to enhance wildlife health at an international level.

Why is this important?

Wildlife populations are distributed widely across North America and movement of wildlife, and their associated diseases, are not limited by political boundaries. In addition, human related activities, such as international trade and travel, threaten the health of North American wildlife via the introduction of invasive species and disease. Consequently, there is a need for international coordination and sharing of information to address these problems.

What will be done?

The NWHC will work through the World Organization for Animal Health (OIE) as a Collaborating Centre to achieve Strategy 2, will formalize and strengthen its relationship with the Canadian Cooperative Wildlife Health Centre, and establish contacts in Mexico. The NWHC will also respond to international requests for consultation and assistance as the needs arise, and resources allow.

When will it be accomplished?

This will be initiated in 2012, and will be ongoing.

1.1.3 - Strategy 3: Establish and strengthen partner relationships through attendance and active participation in selected meetings, conferences, committees, and work groups that address crucial wildlife health issues nationally and internationally.

Why is this important?

Active participation in priority meetings is critical to developing and maintaining a network of partners. It also provides opportunities to understand the needs and expectation of our partners. Through purposeful and active participation in these events, we will seek to maximize the value of these face-to-face opportunities and the value of the information that is shared.

What will be done?

Meeting and conference attendance by NWHC staff will be proactively planned to maximize information sharing and partner interaction. We will assess the value of information shared with our partners, and the importance for establishing and maintaining partner relationships. Current and potential involvement of NWHC staff in committees and focused work groups will also be evaluated.

When will it be accomplished?

This is a current activity and will be continued for the duration of this plan.

1.1.4 - Strategy 4: Identify and develop scientific exchange and relationships with other institutions and agencies.

Why is this important?

The increasing complexity of wildlife health issues we face will require increasingly complex solutions. Multidisciplinary and multi-institutional science teams will be critical, especially to leverage the expertise and resources necessary to understand these wicked problems and perform the needed research. We will leverage existing NWHC capacity to address these issues by partnering with other government agencies, academia, NGOs and the private sector. Sharing knowledge will enhance these scientific activities. In short, exchange of staff and the relationships established through these contacts will support the long-term, productive partnerships required to achieve our collective science goals.

What will be done?

The NWHC will formalize its internship program for students, host visiting scientists, and create a scientist and staff exchange program. We will also explore other possible mechanisms such as fellowships to encourage graduate student participation in our work.

When will it be accomplished?

This will be established in 2012 and will be ongoing.

1.2 - Objective 2: Collectively define the vision and components of a North American Wildlife Health Strategy and build multi-institutional capacity to begin implementation.

1.2.1 - Strategy 1: Publish a white paper on a North American Wildlife Health Strategy.

Why is this important?

It is important to outline an operational framework for response, preparedness, and coordination among diverse partners to address the most pressing wildlife health issues, so that a common understanding is reached regarding roles and responsibilities. Consequently, the role of NWHC and other contributing partners and agencies within the NAWHS will be defined, and areas of shared responsibilities identified. This will ultimately provide a clear basis to implement our collective actions.

What will be done?

A team will be formed within the collaborative Wildlife Health Working Group to develop and write the white paper. The NWHC will provide the logistical support to achieve this objective. The NAWHS white paper will include how coordinated risk identification and assessment, surveillance, diagnostic criteria development, data sharing, prioritization, disease management and communications will be achieved, among other activities.

When will it be accomplished?

This work will be initiated in 2012 and completed in 2014.

1.2.2 - Strategy 2: Support cooperative, multi-institutional capacity building in diagnostics, field investigation, disease management, and sampling techniques for disease control.

Why is this important?

It is vital that all partners have the capacity needed to address our shared responsibility to successfully implement a North American Wildlife Health Strategy (NAWHS).

What will be done?

The NWHC will partner with others to develop shared institutional capacity using online tools, workshops, and other materials, and respond to requests for assistance and consultation as they arise, and resources allow.

When will it be initiated?

This will be initiated in 2012 and will be ongoing.

GOAL 2

Provide nationally comprehensive wildlife health information based on collective knowledge and make this information available to a broad audience of professionals, general public, media and decision makers.

Preamble

The NWHC provides crucial information on wildlife diseases to wildlife managers to support sound management decisions. The NWHC has some of the largest databases of wildlife diseases in the Nation providing valuable baseline information. If properly curated and analyzed, these data offer the potential to determine the biological and ecological significance of disease events, as well as detect disease trends over time and space. Moreover, this information allows us to gain insight into the significance of future wildlife disease events. The NWHC will creatively utilize multiple technologies and formats to improve information sharing and enhance data accessibility to our partners. We will also ensure that information generated by the NWHC is compatible with various electronic formats and be of sufficient content to facilitate its use for multiple purposes. As it is clear that greater success can be achieved through collaboration and partnership, we will ensure that our contribution to science and wildlife health is clear, understandable, and relevant information is presented in a way that optimizes its use.

2.1 - Objective 1: Create and manage information support structures for enhanced use of scientific information.

2.1.1 - Strategy 1: Develop an information and data management plan for the National Wildlife Health Center.

Why is this important?

A well thought out information management plan helps ensure information and data usability by providing guidance on the organization, format and documentation of data and information. It is the foundation for performing data collection and information sharing activities throughout the goals in the strategic plan.

What will be done?

A team will be formed to create an information management plan that broadly encompasses our information and data. The management plan will include the policies and guidelines for data and information collection and storage including terminology and technical standards employed, data sharing policies and lifecycle planning.

When will it be accomplished?

This will be initiated in 2012.

2.1.2 - Strategy 2: Update informatics support structures to collect, generate and disseminate information.

Why is this important?

The underlying structures for collecting, storing and manipulating data and information are the foundations for doing our work. Improving the support structures will increase the speed and ease of creating, processing, and sharing data and information to decision makers.

What will be done?

The Laboratory Information Management System (LIMS) will be enhanced to improve usability by end of 2012 while working on implementing a more comprehensive solution. It will be enhanced to increase user friendliness, flexibility and searchability thus maximizing opportunities to share information internally and externally. Possible enhancements include online submission of information and more efficient diagnostic test results tracking, among other improvements.

We will pilot a project to identify and standardize cause-of-death terms for better international communication on important wildlife health issues by end of 2012.

We will implement a “help-desk” system to respond to queries from the public and our partners for scientific information and services. This will provide faster turnaround time for information requests.

When will it be accomplished?

This will be initiated in 2012.

2.1.3 - Strategy 3: Evaluate and annotate existing NWHC data sets and make them more accessible online.

Why is this important?

NWHC activities have generated a tremendous amount of high quality data and information that does not exist elsewhere, making it a valuable resource. Improved accessibility to data and information from targeted, annotated data sets through various methods will provide transparency in our science and create opportunities to explore new findings and build on our knowledge, in collaboration with others. This will also identify other data to incorporate as appropriate to add to the depth of understanding.

What will be done?

We will identify and remedy limitations in the NWHC Laboratory Information Management System (LIMS) and Epizootiologic (EPIZOO) databases to make the Center’s diagnostic and mortality event information more accessible. In addition, we will evaluate discrete research data for wider utility and make selected datasets available online.

When will it be accomplished?

This will be initiated in 2012, and will be ongoing.

2.1.4 - Strategy 4: Explore options for diverse users to document and track wildlife disease events with centralized, standard reporting and user-generated reports.

Why is this important?

Managers need timely, relevant information to make sound science based decisions. Being aware of current disease trends locally and more broadly can inform managers and decision

makers. Improved information flow among users and diagnostic facilities will broaden the base of data used for determining disease status and trends, and making management decisions.

What will be done?

NWHC will evaluate and develop tools that facilitate the sharing of wildlife disease event information and begin work on implementation of the most effective tool. We will provide an interactive platform that will allow users including wildlife managers and citizen scientists to input and retrieve information and help build the collective knowledge of wildlife mortality events. Data sharing with partners will be encouraged for better information exchange about wildlife health.

When will it be accomplished?

This will be initiated in 2012, and will be ongoing.

2.2 - Objective 2: Aggregate, analyze, and interpret data on wildlife diseases and their relationship to global health issues.

2.2.1 - Strategy 1: Explore data analysis methods and practices used for early detection of disease issues for adaptability to wildlife health data to allow for earlier situational awareness of wildlife health issues.

Why is this important?

Human and domestic animal health epidemiologists use a variety of techniques to analyze diagnostic and surveillance data for emerging trends in diseases. Some of these approaches may be applicable to wildlife data for earlier situational awareness of health issues. Learning about these techniques from our One Health partners will give wildlife scientists new ways of monitoring wildlife health for new and emerging diseases or resurgence of endemic diseases, some of which may be important to human and domestic animal health.

What will be done?

We will develop new tools for wildlife professionals that will be used for earlier awareness of disease situations and provide greater options for disease prevention and control for decision makers. Some of these methodologies may be applied to the priority diseases identified in Goal 3.

When will it be accomplished?

This will be initiated in 2013.

2.3 - Objective 3: Create innovative information resources that will expedite clear and rapid communication of wildlife health issues to wildlife managers, policy makers, and the public.

2.3.1 - Strategy 1: Establish NWHC's online presence as a priority for communication with stakeholders.

Why is this important?

Current technology has altered expectations for constant, location independent accessibility of information on the user's terms. Keeping abreast of evolving information exchange methods will facilitate ease of use and availability of information for a variety of users.

What will be done?

More of our information and data will be provided online in a variety of formats to allow constant access on demand by decision makers. We will revise and update the NWHC website to better communicate our activities and science. We will create products that make use of current technologies to reach a broad audience through a variety of online channels.

When will it be accomplished?

Modifications to NWHC website will be completed in 2013, and will be continuously evaluated for improvements and updates as needed.

2.3.2 - Strategy 2: Utilize the depth of knowledge of NWHC scientists and staff as an integral part of a comprehensive learning and discovery campus.

Why is this important?

The vast experience and knowledge of our staff in wildlife disease investigation and research is unparalleled and one of the Center's most valuable resources. Sharing information and techniques with others through training will improve the Nation's ability to address the most pressing wildlife disease and health issues.

What will be done?

NWHC will host both virtual and live workshops, conduct training, create training materials, and facilitate exchange of information with partners, students and other scientists and staff. We will seek opportunities to collaborate with other partners to achieve this work.

When will it be accomplished?

Current activities will be evaluated and expanded and new efforts initiated in 2013. This will be an ongoing activity.

2.3.3 - Strategy 3: Increase the visibility of NWHC science, staff and two campus locations.

Why is this important?

Enhancing the visibility of NWHC science and capabilities will help advance wildlife and ecosystem health by making others more aware of wildlife health perspectives in global health issues. Strong science can play a pivotal role in making sound decisions for managing wildlife resources, and improving the health of wildlife, domestic animals and humans. By promoting the science of NWHC and our partners, and referencing the unique knowledge and skills of our staff, we will make new audiences aware of the science available, its importance, and how it can best be used to address issues of concern.

What will be done?

We will create an inventory and evaluation of current NWHC outreach and communications activities and develop a proactive outreach and communication plan. That plan along with the science priorities from the other goals would form the basis for developing new information products, including science products. We will also use the NWHC's collective expertise to provide scientific understanding of data and wildlife health issues through various means including creating interpretive summaries to accompany information and science products such as updating the Field Guide to Wildlife Diseases.

When will it be accomplished?

Evaluation of current materials and plan development will be completed in 2012. Initiation of new products will begin in 2013 and will be ongoing.

GOAL 3

Conduct exceptional science to anticipate, detect and assess wildlife diseases, and support the management of wildlife and ecosystem health.

Preamble

One of the greatest strengths of the NWHC is our ability to conduct integrated laboratory and field research to better understand the epidemiology and ecology of wildlife diseases. Coupled with our historical strengths of disease detection and response we are uniquely poised to expand our approach to include a more proactive perspective on wildlife disease. The advent of new analytical models and bench assays will provide us with the tools to anticipate disease threats to wildlife, understand the distribution, dynamics, and impacts of disease, and ultimately provide better information for guiding management decisions. We recognize that many other institutions and individuals have complementary strengths and expertise. In partnership with others, we will use our unique capabilities and strengths, including our Biosafety Level 3 research and diagnostic facilities to achieve this goal.

3.1 - Objective 1: Identify the threats to wildlife health.

3.1.1 - Strategy 1: Develop and maintain a comprehensive knowledge of priority threats to North American wildlife health.

Why is this important?

Identifying and understanding disease agents and other factors that threaten the health of wildlife are critical first steps for maintaining healthy populations. Furthermore, prioritization of these threats is important for the development of effective management plans, allocation of precious resources, and serves as the foundation for our future science direction.

What will be done?

We will conduct the following activities:

- Develop and apply techniques developed in Goal 2, Objective 2, Strategy 1 for prioritization and risk analysis of current and future threats to wildlife.
- Provide guidance to USGS and partners regarding what we determine as priority threats to wildlife health.
- Utilize institutional and external knowledge of past disease surveillance programs and research to be more effectively prepared for threats to wildlife health.
- Continue to provide disease investigation services and diagnostic expertise to detect current and emerging threats to wildlife health.

When will it be accomplished?

We will communicate priorities on current disease threats to wildlife in 2013 and this will be continued on an ongoing basis.

3.1.2 - Strategy 2: For prioritized diseases, develop and deploy laboratory and field diagnostic assays and services, and expand capacity to design and implement disease investigation and surveillance.

Why is this important?

Identification of pathogens and causes of morbidity/mortality of wildlife requires accurate, consistent, and accessible diagnostic capacities. The development of laboratory and rapid field diagnostic assays are critical tools for disease investigations. In addition, standardization of these techniques and expansion of technical capacity and expertise are key components of effective assay deployment. Building upon this diagnostic foundation, targeted wildlife disease surveillance plans are critical for the early detection of endemic and novel disease agents and allows for rapid response and management to mitigate disease effects.

What will be done?

We will conduct the following activities:

- Expand our capacity and capability to conduct accurate and timely diagnostic testing for the purposes of detecting novel pathogens, investigating unusual mortality events, and assisting management agencies.
- Conduct proactive, time-limited, targeted surveillance for priority diseases. Participate and assist in surveillance efforts to focus on national wildlife health concerns, and expand international collaborations.
- We will utilize data from wildlife disease outbreak investigations, necropsy and diagnostic testing, and morbidity/mortality reports to facilitate early detection of threats to wildlife health.
- Expand technical partnerships for specialized expertise in toxicology, phylogenetics, molecular biology, and informatics. Identify USGS expertise in these specialized areas, as well as explore expertise available in other institutions (universities, state agencies, etc.).
- We will work with our partners to gain and provide technical training, and support expansion of diagnostic capacities and standardization of techniques.

When will it be accomplished?

Development and deployment of diagnostic assays is ongoing and directed by current and anticipated needs. Surveillance and training projects will be initiated in 2013.

3.2 - Objective 2: Understand threats to wildlife health, and assess the effects of ecological and anthropogenic factors on disease emergence.

3.2.1 - Strategy 1: Develop integrated laboratory and field studies to understand the mechanisms and epidemiology of wildlife diseases.

Why is it important?

Disease interactions occur within a triad of the host, the pathogen, and the environment. Understanding components within each of these domains and how they interact with each other provides us with a more comprehensive understanding of the threats posed to wildlife health on the landscape.

What will be done?

We will conduct focused field and laboratory studies and guide development of surveillance programs on priority wildlife diseases to better understand threats to wildlife health. This will include investigations of disease mechanisms (immunity, pathogenesis, toxicosis, etc.) and epidemiology and disease dynamics in single or multi-host populations. We will utilize information gained from research and surveillance activities to help anticipate the effects of disease on wildlife populations and develop scientifically based management recommendations.

When will it be accomplished?

NWHC currently conducts field and laboratory studies to better understand threats to wildlife health. This strategy is ongoing.

3.2.2 - Strategy 2: Develop models and other analytical tools (phylogenetic and geospatial analyses, etc.) to understand how disease affects wildlife, the role it plays in the dynamics and geographic distribution of populations, and the possible implications to human and domestic animal health.

Why is this important?

The complexity of wildlife diseases and limitations inherent in wildlife population and disease data create challenges to understanding and managing diseases in wildlife. Models provide a tool to meet these challenges by providing a quantitative understanding of priority diseases and their impact on wild populations, as well as potential effects on domestic animals and humans.

What will be done?

The application of existing epidemiological models and novel analytical methods and tools will be used to assist in defining the impact of disease on species and populations to more effectively inform management and decision makers. We will apply enhanced molecular and genetic analysis through expansion of internal capabilities and technical partnerships to enable examination of host and pathogen interactions, genetic variability, and population gene flow. We will also develop capabilities in geospatial analyses.

When will it be accomplished?

Capacity development and application of epidemiological modeling, genetic analysis and geospatial analyses at NWHC have been initiated. These will continue to be a focus in 2012 and is ongoing.

3.2.3 - Strategy 3: Evaluate the potential effects of environmental factors at multiple scales (local to landscape level) on the occurrence and magnitude of disease and other threats to wildlife health.

Why is this important?

Environmental factors such as climate, land use, and various human activities can play a key role in the expression of disease in wildlife and understanding this dynamic role may enable prediction of threats to wildlife and identification of potential management strategies.

What will be done?

Selected environmental data will be collected proactively and in conjunction with wildlife health investigations. We will also conduct retrospective analyses of status and trends of disease outbreaks to generate hypotheses regarding environmental drivers of wildlife disease. The results from these activities will be used to develop tools to predict the effect of environmental factors such as climate change, habitat usage, agricultural practices, invasive species, and other anthropogenic factors on wildlife health parameters such as fitness, migration, community and disease dynamics, etc.

When will it be accomplished?

This will be initiated in 2013.

3.3 - Objective 3: Conduct research to develop and evaluate current wildlife disease management tools, strategies, and other techniques to support sound management of natural resources.

3.3.1 - Strategy 1: Explore tools and applications to manage wildlife diseases.

Why is this important?

Effective, economically feasible techniques and tools for managing disease in wildlife populations are critical for sustaining wildlife populations. As eradication of disease is often impractical in free-ranging wildlife, the focus of management actions is mostly directed at limiting the spread and impacts of a disease. However, even these management goals can be challenging, especially in response to novel health threats and emerging diseases. Understanding the effectiveness of current management tools and developing novel management schemes are important for protecting the health of wildlife populations, as well as domestic animals and humans.

What will be done?

We will evaluate current wildlife disease management methods, and identify the potential for wildlife disease management applications directed at specific problems, including vaccines, environmental manipulation, translocation, etc. We will investigate and develop methodologies for delivery of vaccines or therapeutic agents to different species, and explore potential use of these management tools to manage wildlife diseases in closely managed or special concern populations.

When will it be accomplished?

Some of these are ongoing, and others will be initiated in 2013.

3.3.2 - Strategy 2: Identify opportunities for intervention to control wildlife disease and evaluate the outcome of management applications.

Why is this important?

Managing disease in wildlife populations is challenging and requires adaptive strategies to respond to dynamic systems. Evaluating the efficacy of current and proposed management tools/strategies and determining the ecological and economic consequences of their applications are critical to management decisions.

What will be done?

The following activities will be performed:

- Utilize epidemiologic models and other analytical methods to evaluate proposed disease management techniques and determine the most effective application strategies.
- Support wildlife management agencies in the application of recommended tools/strategies by assisting with ongoing outcome assessments.
- Conduct field investigations and targeted disease surveillance or health assessments to evaluate the effectiveness of applied management strategies.

When will it be accomplished?

This will be initiated in 2013.