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# USDA APHIS Wildlife Services' National Wildlife Disease Surveillance and Emergency Response System (SERS)

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**ABSTRACT:** USDA APHIS Wildlife Services has established a National Wildlife Disease Surveillance and Emergency Response System (SERS). The goal of SERS is to develop and implement a nationally coordinated disease monitoring system aimed at safeguarding wildlife populations, agriculture, and human health and safety from disease threats. The SERS is designed to provide an infrastructure capable of assisting state, federal, and tribal agencies with both routine disease monitoring and in addressing wildlife disease threats. Supplementing existing programs with a nationally coordinated wildlife surveillance system facilitates information exchange among the programs, ensures diseases of national bio-security concern (e.g., plague, tularemia, avian influenza, classical swine fever) are adequately sampled, and additionally, provides field and laboratory infrastructure which is available to assist other agencies with sampling collection and disease diagnosis during emergency outbreaks. The SERS currently consists of national program staff and 23 wildlife disease biologists distributed throughout the country. During 2005, these biologists provided disease surveillance assistance to 17 states for chronic wasting disease, 19 states for West Nile virus, 18 states for rabies, and numerous other states for surveillance of 18 other diseases. In 2005, the SERS program coordinated national level surveillance systems for plague and tularemia (18 states) and for diseases in feral swine (14 states). Currently, SERS is coordinating a National Early Detection System for Asian influenza H5N1 in migratory birds, in collaboration with other federal and state partners.

**KEY WORDS:** bio-security, disease, SERS, surveillance, Wildlife Services, zoonosis

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## OVERVIEW

It is generally recognized that countries conducting disease surveillance in wildlife populations are more likely to understand the epidemiology of specific infectious diseases and zoonotic infections and are thus better prepared to protect wildlife, domestic animals, and humans. Accordingly, active surveillance for known diseases of economic or public health importance among wildlife is of particular benefit to the national interest. For this reason, the World Organization for Animal Health has encouraged all countries to develop and maintain wildlife disease surveillance systems that complement and support agricultural animal disease programs.

A national system of disease surveillance is based on a strategic premise that safeguarding the health of animals, humans, plants, and ecosystems makes possible safe agricultural trade and reduces losses to agricultural and natural resources. In Homeland Security Presidential Directive/HSPD-9, Defense of United States Agriculture and Food (Bush 2004), federal agencies were directed to "develop robust, comprehensive, and fully coordinated surveillance and monitoring systems, including international information, for animal disease, plant disease, wildlife disease, food, public health, and water quality, that provide early detection and awareness of disease, pest, or poisonous agents." HSPD-9 further directed federal agencies to "ensure that the combined federal, state, and local response capabilities are adequate to respond quickly and effectively to a terrorist attack, major disease outbreak, or other disaster affecting the national agriculture or food infrastructure." HSPD-9 tiers from

and supports Homeland Security Directive/HSPD-8, National Preparedness (Bush 2003) which directs federal agencies "to strengthen the preparedness of the United States to prevent and respond to threatened or actual domestic terrorist attacks, major disasters, and other emergencies..."

USDA APHIS Wildlife Services (WS) set a goal of developing and implementing a National Wildlife Disease Surveillance and Emergency Response System (SERS) for the purpose of safe-guarding American agriculture, human health and safety, and wildlife populations. SERS was designed to provide a national infrastructure capable of assisting and supporting state, federal, and tribal agencies with wildlife disease threats. By providing a nationally coordinated wildlife surveillance infrastructure that is designed to interact with and support existing disease monitoring programs, it is WS' aim to acquire synergistic results from collaborative efforts. WS is making the SERS available to support existing programs with the collection of samples, facilitate information exchange among the programs, ensure diseases of national bio-security concern (e.g., plague, tularemia, classical swine fever, etc.) are adequately sampled, and provide additional laboratory infrastructure that can be made available to assist other agencies in disease diagnosis during emergency outbreaks.

WS has developed partnerships with APHIS Veterinary Services (VS) and International Services (IS), U.S. Department of Homeland Security (DHS), and Canadian and Mexican agriculture, health, and natural resources agencies to implement a border disease surveillance

program involving livestock and wildlife. The enhanced bio-security benefit, which is an inherent byproduct of this program's increased level of border disease surveillance, should help facilitate the agricultural agreements in the North American Free Trade Agreement by increasing trade in agricultural products and eliminating the use of sanitary measures as artificial trade barriers. Furthermore, this international border disease surveillance system is a proactive approach to reducing the likelihood of surprise impacts coming from potential terrorist attacks on agriculture, wildlife, and humans.

WS' SERS program was implemented through the establishment of a National Wildlife Disease Coordinator ("Coordinator") and a cadre of Wildlife Disease Biologists (WDBs) assigned to WS field offices. The Coordinator, as an initial action, convened several advisory panels consisting of wildlife, disease, and epidemiologic experts. The Coordinator and these panels worked together to develop sampling and emergency response protocols for agents of concern (e.g., Plague & Tularemia Advisory Panel, and Swine Diseases Advisory Panel). These protocols, in many instances, specify the roles of WDBs in assisting other agencies in their disease surveillance and control operations.

In addition to providing assistance to state, tribal, and other federal agencies in accomplishing their disease surveillance and control objectives, WDBs serve as liaisons within their assigned state(s) among WS, VS, state departments of health, agriculture, and natural resources, and other state, tribal, and federal agencies concerned with wildlife disease issues. The WDBs are also available to rapidly mobilize and assist with disease outbreaks and other emergencies (e.g., hurricanes, floods, etc.) requiring WS participation.

The Coordinator is also responsible for developing additional funding and collaborative opportunities to further establish diagnostic, epidemiologic, research and geographic information system support within WS and other agencies and organizations (e.g., National Veterinary Services Laboratory, Centers for Epidemiology and Animal Health, Agricultural Research Service, National Wildlife Health Center, Centers for Disease Control (CDC), state and university diagnostic facilities). This type of a support network is critical for the SERS' long term successful integration with existing agricultural and wildlife surveillance systems across the nation.

Development of a National Wildlife Disease SERS infrastructure within WS is a critical component of APHIS' mission to protect the health and value of American agriculture, natural resources, and human health and safety. APHIS recognizes the ongoing interface that exists between agricultural animals, livestock and poultry, and wildlife. Regular and routine monitoring programs involving wildlife are an increasingly important part of national disease eradication programs aimed at protecting the health of nation's agricultural resources. Consequently, routine monitoring and active surveillance for known diseases of economic or public health importance among wildlife is particularly beneficial to the national interest.

As part of its strategic plan, APHIS has focused on strengthening emergency preparedness and response, and

managing issues related to the health of U.S. animal resources and conflicts with wildlife. The strategies to accomplish these objectives include developing a more robust nationally-coordinated pest and disease surveillance system, which involves federal, state, academic, and private industry resources and coordination. APHIS has also enhanced its emergency response infrastructure by incorporating the Incident Command System (ICS) into animal health emergency response plans as directed in Homeland Security Presidential Directive/HSPD-8 (Bush 2003). Additionally, APHIS and its stakeholders have identified the need to manage and research wildlife diseases, particularly those that are transmissible to humans and domestic species.

An integral part of a complete national strategy for monitoring animal diseases and quickly responding to disease introductions is a national monitoring and surveillance system for wildlife diseases. Additionally, such a national disease monitoring strategy also must include the capability to investigate events of mass morbidity and mortality and new disease syndromes, identify and categorize new pathogens, and monitor the status of known diseases within wildlife populations. This type of active surveillance system allows for quick detection, containment, and eradication of wildlife diseases. SERS was established to be this type of a system, and is based on a strategic premise that safeguarding the health of animals, humans, plants, and ecosystems makes possible safe agricultural trade and reduces losses to agricultural and natural resources.

Protecting American agriculture, humans, and wildlife from disease epizootics requires both proactive (monitoring/surveillance) and reactive (emergency response) capacities. A monitoring and surveillance system is, by definition, comprised of the two components, monitoring and surveillance (Stärk 1996, Noordhuizen *et al.* 1997, Doherr and Audigé 2001, Salman 2003). The monitoring component of the system assesses the health and disease status of a given population through ongoing or repeated sampling. In the case of endemic diseases such as rabies, pseudorabies, tularemia, and plague, the establishment of a comprehensive monitoring system provides animal and human health officials with data necessary to evaluate threats due to increases in prevalence and distribution, to assist in evaluating the causes (e.g., natural epizootic vs. intentional release) of such changes, and to notify local health providers of the presence of the health threat for consideration in diagnostic evaluations. Routine monitoring of wildlife for diseases also aids in earlier detection of both unintentional and intentional introductions of foreign animal diseases into wildlife populations.

The surveillance component of the system is similar to that of monitoring. Both monitoring and surveillance rely on comparative sampling and observation over time. However, a monitoring system is primarily "passive" in nature, with the primary purpose being to "observe" or "assess", while a surveillance system is more "reactive", and an "action" is set to occur if a predefined threshold is seen to have been exceeded. Collectively, monitoring and surveillance provides information on the distribution, incidence, and trends of diseases in populations.

Surveillance takes monitoring one step further by having an established predefined intervention strategy for managing diseases when an unacceptable level of risk to agriculture, wildlife, or human health and safety occurs. Surveillance systems, unlike monitoring systems, require an ability to react or respond when established parameters are detected.

The emergency response facet of SERS is designed to implement disease management interventions in a rapid response mode in reaction to a foreign disease incursion or epizootic of an endemic disease. Such a system requires dedicated personnel and equipment, training, and interagency communication and cooperation.

The role of WS in wildlife disease surveillance is primarily facilitation and service. When integrated with existing national animal health surveillance infrastructures, monitoring and surveillance programs in wildlife provide an important component in securing animal health, animal-based export trade, and safeguarding public health. Ownership and management of wildlife is primarily under the jurisdiction of the states and tribes, and agencies within the U.S. Department of the Interior that regulate the management of migratory, threatened, and endangered species. Additionally, health departments have authority to regulate wildlife diseases which also affect humans, such as rabies. Therefore the most effective and efficient wildlife disease surveillance system depends upon the coordination and cooperation of all these agencies.

A number of surveillance programs for diseases in wildlife already have been established by state departments of natural resources, the National Wildlife Health Center (NWHC), universities (e.g., SCWDS), and USDA-VS. WS' SERS supplements these programs by providing a nationally coordinated wildlife surveillance infrastructure that assists existing programs with the collection of samples, facilitating information exchange among the programs, ensuring diseases of national biosecurity concern (e.g., plague, tularemia, classical swine fever) are adequately sampled, and by providing additional laboratory infrastructure that would be available for assisting other agencies in disease diagnosis in emergency outbreaks.

Within APHIS, WS is the best fitted program to develop the SERS because WS has the authority and capability to develop and implement these nationally coordinated wildlife surveillance systems under the Animal Damage Control Act of 1931 as amended (7 U.S.C. 426-426c). Also, WS is the program within APHIS that is best suited to develop a monitoring and emergency response system involving free-ranging animal populations which can support and compliment existing programs. WS has a long history of cooperatively working with federal, state, and local agencies, non-governmental organizations, tribes, and the public to manage wildlife.

SERS' enhancement of operational and research-based activities within WS in coordination with other government entities encourages the development of national cooperative strategies for management of disease in wildlife. The development of national level cooperative strategies for management of wildlife diseases will

result in improved development and integration of monitoring and surveillance techniques and information, the application of disease control methods on state, regional, national, and/or international levels, and provide national expertise on a cooperative basis with state efforts to deal with local wildlife disease events.

## **THE DEVELOPMENT OF WILDLIFE DISEASE MONITORING AND SURVEILLANCE CAPABILITIES WITHIN WS**

WS recognized that the successful implementation of a nationally integrated monitoring and surveillance system for wildlife diseases would depend on the cooperation of many governmental and nongovernmental entities. WS, in conjunction with the different governmental and nongovernmental entities, would need to:

- identify populations of animals and diseases of concern,
- determine methods for monitoring diseases,
- obtain samples for diagnostic analyses,
- identify laboratories capable of conducting specific diagnostics, and
- evaluate and report results in timely manner.

Initially, WS placed its focus on the first three activities primarily because WS is a field oriented service agency. However, in order to fully implement the surveillance plan, WS personnel have worked toward the establishment of partnerships with the other agencies and groups previously discussed, and to support wildlife disease research programs at the USDA National Wildlife Research Center (NWRC), Agricultural Research Service (ARS), NWHC, and universities.

WS' first step in developing the SERS consisted of identifying specific diseases of primary concern. The Coordinator, with input from other WS personnel (i.e., state directors, WDBs, NWRC researchers), USDA personnel (e.g., VS, ARS, etc.) and other sources with expertise in animal diseases (e.g., NWHC, SCWDS, DHS, universities, etc.), developed a list of diseases of concern. The list of diseases consisted of a combination of agents that are endemic, foreign animal diseases, exotic zoonoses, or of agro/bioterrorism concern (Table 1). The identification process for developing the list of diseases of concern is a dynamic process and, although, an initial list has been devised, it will be necessary for the Coordinator to periodically update it as new issues/concerns develop or as diseases are eradicated. As diseases are identified, the Coordinator will work with WS' management team to prioritize them based on the capabilities of the WS program.

WS' next step in implementing SERS was to devise disease specific strategies for surveillance and management. The Coordinator established advisory panels for the disease(s) and chair for each panel. These panels were comprised of WS personnel (i.e., WS state directors, WDBs, NWRC researchers), and other agencies and academicians with knowledge of the respective disease, reservoir species, or epidemiology. The responsibility of each advisory panel was:

- Identifying training needs for personnel
- Identifying diagnostic resources
- Developing a disease-specific monitoring or

**Table 1. WS National Wildlife Disease SERS-identified diseases of interest.**

Endemic Diseases
West Nile virus
Bovine tuberculosis
Pseudorabies
Bovine brucellosis
Swine brucellosis
Canine distemper
Hantavirus
Lyme disease
Plague
Tularemia
Chronic wasting disease
Rabies
Johne's disease
Exotic Zoonoses
Rift Valley fever
Glanders
Monkey pox
<i>Brucella melitensis</i>
Foreign Animal Diseases
Foot and mouth
Newcastle
Classical swine fever
African horse sickness
Bovine spongiform encephalopathy
Heartwater
Avian influenza
Hog cholera

surveillance plan, and

- Coordinating, monitoring, and evaluating implementation of the monitoring or surveillance plan.

Once the advisory panels developed their disease specific plans, the collection of biological/environmental samples for monitoring and surveillance commenced. A core group of 23 WS WDBs, collaboratively working with other federal and state personnel, were given the primary responsibility for sample collection. Specifically, the WDBs were tasked with:

- Working closely with the Coordinator to establish and implement a National Wildlife Disease SERS network.
- Collecting, preserving, and shipping biological samples from a variety of animal species according to guidelines established by the USDA, the Coordinator, advisory panels, and diagnostic laboratories.
- Serving as liaisons in their state(s) of responsibility among WS, VS, state departments of health, agriculture, and natural resources, and other state, tribal, and federal agencies concerned with wildlife disease issues.
- Participating in WS disease control activities, and seek out opportunities to provide assistance to state, tribal, and other federal agencies in accomplishing their disease control objectives.
- Responding to disease outbreaks and other emergencies that require WS participation.

In FY04, the initial group of 23 WDBs began conducting monitoring and surveillance activities. It is anticipated that as the program develops, additional biologists will be needed to increase WS' capabilities to

conduct SERS activities across the nation.

WDBs collect biological samples through a variety of techniques (e.g., trapping, mist netting, shooting, etc.). However, every effort is made to obtain samples in coordination with existing WS operational (e.g., protection of livestock, airports, and aquaculture, urban wildlife management, etc) and research activities to maximize efficiency and minimize animal numbers. This "opportunistic" approach to sampling requires that the WDBs coordinate their collection activities with state directors and district supervisors. If situations arise where WDBs are not able to attain their sample collection goals through existing WS activities, they seek out opportunities to coordinate their collections with other organizations' or agencies' activities or conduct specific sampling efforts.

As mentioned earlier, full implementation of the SERS requires diagnostic and epidemiologic support. The Coordinator has been tasked with securing funding and collaborative opportunities to develop this support within other agencies and organizations through the USDA budgetary process. Additionally, WS' NWRC has been developing laboratory facilities that will serve as diagnostic support for specific diseases and has added to its staff. The NWRC is expected to continue developing disease surveillance support capabilities. In particular, NWRC's anticipated construction of a bio-safety level 3 wildlife disease research building in Fort Collins, CO, will significantly increase APHIS' capability to prepare for, and react to, foreign animal disease threats.

Finally, the success of an international disease surveillance system, modeled after the national SERS program, is dependent on a variety of technical and political factors. However, cultural and lingual differences are additional constraints. Therefore, active communication among the various agencies has been essential. Working through IS and the Pan American Health Organization, WS has participated in international meetings to identify diseases of concern, developed border surveillance strategies, identified infrastructure requirements and potential funding strategies, and shared information. The WDBs have worked with WS state directors in the states along the border to collect samples as well as assisting other state and federal agencies in surveillance activities along the border areas associated with both Canada and Mexico.

### **THE DEVELOPMENT OF EMERGENCY RESPONSE CAPABILITIES WITHIN WS**

Similar to the monitoring and surveillance activities, the WS management team, Coordinator, and advisory panels have guided the development and implementation of emergency response plans. However, emergency management actions, being reactive rather than proactive, have occurred much more rapidly than have the surveillance activities. In most situations, WS' emergency response actions have been in a supportive role to other agencies (e.g., VS, CDC, state departments of health and agriculture) in an emergency. Because most agencies are using the ICS to coordinate and implement emergency response, WS personnel have trained in, and developed efficiency in ICS application. Also, WS has

coordinated emergency activities through USDA and DHS to meet the all-hazards preparedness goal outlined in HSPD-8. Additionally, WDBs have participated in numerous test exercises for responding to disasters such as the intentional introduction of a zoonotic organism.

One of the primary functions of the WDBs is to respond to emergency disease outbreaks. The WDBs form the core of WS' emergency response program. WDBs are required to be able to mobilize within 24-48 hours to an identified site of an emergency. To ensure an adequate level of readiness, WDBs are routinely mobilized with short notice to assist with state, federal, and tribal disease surveillance and management activities. Although these mobilizations are not generally emergency actions, SERS uses the non-emergency mobilizations as training for emergency mobilizations by conducting them under similar constraints (i.e., surprise announcements and short reporting time requirements). The Coordinator works closely with the WS regional offices, state directors, and NWRC to facilitate both these training mobilizations and emergency response actions.

Although the response plans developed by the advisory panels detail WS' specific roles and activities in disease outbreaks, all emergency response activities are coordinated through the APHIS Emergency Operations Center. In most instances, WS will serve as a support agency, providing research and operational functions. WDBs, epidemiologists, ICS personnel, and research staff working within the SERS are available to assist the designated lead agency (e.g., VS, CDC, state agencies) with sample collection, disease eradication, and public education.

Although the basic framework for the National Wildlife Disease SERS (i.e., Coordinator, 23 WDBs, wildlife disease staff biologists, and administrative support staff) are in place, considerably more resources would need to become available to fully implement this system across the nation. The additional resources needed include additional personnel, equipment and supplies, training, research, and diagnostic and epidemiologic support.

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