

# **NEWCASTLE DISEASE STANDARD OPERATING PROCEDURES: 3. SURVEILLANCE**

## **FAD PReP**

**Foreign Animal Disease**

**Preparedness & Response Plan**



**United States  
Department of  
Agriculture**

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The Foreign Animal Disease Preparedness and Response Plan (FAD PReP) Standard Operating Procedures (SOPs) provide operational guidance for responding to an animal health emergency in the United States.

These draft SOPs are under ongoing review. This document was last updated in **November 2013**. Please send questions or comments to:

National Preparedness and Incident Coordination  
Veterinary Services  
Animal and Plant Health Inspection Service  
U.S. Department of Agriculture  
4700 River Road, Unit 41  
Riverdale, Maryland 20737  
Telephone: (301) 851-3595 Fax: (301) 734-7817  
E-mail: [FAD.PReP.Comments@aphis.usda.gov](mailto:FAD.PReP.Comments@aphis.usda.gov)

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## 3.1 Introduction

Surveillance is a critical activity during an outbreak of Newcastle disease (ND). Surveillance helps to control the spread of the disease and assists with eradication. The U.S. Department of Agriculture (USDA) Animal and Plant Health Inspection Service (APHIS) will coordinate national surveillance activities. This standard operating procedure (SOP) provides the Disease Surveillance Branch, Situation Unit, and other associated Incident Command (IC) personnel with guidance on developing a surveillance plan for poultry, and for conducting surveillance activities in the field.

Several APHIS Foreign Animal Disease Preparedness and Response Plan (FAD PReP) documents complement this SOP and provide further detail when necessary. This SOP references the following APHIS documents.

- FAD Investigation Manual (FAD PReP Manual 4-0)
- SOPs:
  - Cleaning and Disinfection
  - Health and Safety/Personal Protective Equipment (PPE).

Currently, some of the SOPs listed are tailored to highly pathogenic avian influenza. However, in many cases, these documents can be used as a general reference for ND response activities.

Additionally, the FAD PReP/ National Animal Health Emergency Management System (NAHEMS) Guidelines: Surveillance, Epidemiology, and Tracing will discuss surveillance activities. Surveillance guidance for ND is also found in the ND Response Plan: The Red Book.

These documents are available on the internal APHIS FAD PReP website for those who have access to the APHIS intranet, at <http://inside.aphis.usda.gov/vs/em/fadprep.shtml>, or on the public APHIS site at [http://www.aphis.usda.gov/animal\\_health/emergency\\_management/](http://www.aphis.usda.gov/animal_health/emergency_management/).

### 3.1.1 Goals

#### 3.1.1.1 Preparedness Goals

In an outbreak of ND, the preparedness goals of the IC are the following:

- Develop capabilities and relationships to produce surveillance plans within 24–48 hours of a confirmed outbreak.
- Develop effective surveillance plans that can achieve desired outcomes by leveraging available resources, satisfying jurisdictional requirements, and implementing continuity of business plans.

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### 3.1.1.2 Response Goals

In an outbreak of ND, the surveillance goals of the IC are the following:

- Implement surveillance plans within 48 hours of the confirmation of an outbreak.
- Implement a surveillance plan that will (1) define the present extent of ND and (2) detect unknown Infected Premises (IP) quickly.
- Have the surveillance plan consider the susceptible wildlife population in the area, and coordinate with APHIS Wildlife Services, the U.S. Department of the Interior, State wildlife agencies, and State agriculture departments to perform appropriate ND surveillance in these populations.
- Provide complete surveillance data summaries and data analysis at intervals as specified by IC.

### 3.1.2 Guidelines

In the first hours following a detection of ND, there will be multiple requests for surveillance activities. Observe the following guidelines for appropriate surveillance activities in an ND outbreak.

Surveillance plans are required to (1) establish priorities for observational surveillance and diagnostic testing based surveillance within the Control Area (CA) (which includes the Infected Zone [IZ] and Buffer Zone [BZ]) and Surveillance Zone (SZ), (2) establish priorities for Contact Premises (CP) and Suspect Premises (SP), and (3) establish priorities for premises located within the CA that are seeking to demonstrate freedom from ND infection. The following are example objectives of surveillance activities:

- Detect ND IP during an outbreak.
- Determine the size and extent of an ND outbreak.
- Supply information to evaluate outbreak control activities.
- Provide information for animal and product movement within the CA.
- Provide information for animal and product movement out of the CA.
- Prove disease freedom (DF) and regain ND-free status after eradication of the outbreak.

### 3.1.3 Coordination

The following activities need to be coordinated by these entities in the event of an ND outbreak.

- *Preparation of current maps of the Infected, Buffer, and Surveillance Zones:* Coordination between the Animal Movement and Permits Group in the Disease Support Branch (Operations Section), and the Epidemiology Cell and Geographic Information Systems (GIS) Cell of the Situation Unit (Planning Section).
- *Development of specific surveillance plans for premises and zones:* Disease Surveillance Branch (Operations Section) and Situation Unit (Planning Section).

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- *Biosecurity and safety measures*: Coordinate with the Animal Biosecurity and Disease Prevention Group in the Disease Support Branch (Operations Section) and the Medical Unit (Logistics Section).
  - *Reporting of accurate disease information*: Disease Surveillance Branch (Operations Section) and Situation Unit (Planning Section), particularly the Disease Reporting Cell.
  - *Responding to diagnostic laboratory results through surveillance*: Disease Surveillance Branch (Operations Section) and Situation Unit (Planning Section).

### 3.1.4 Assumed Ongoing or Completed Response Activities

These procedures assume the following outbreak response activities are in progress or have been completed before surveillance measures are in place:

- Disease confirmation—completed/ongoing
- Quarantine—ongoing
- Biosecurity procedures—ongoing
- Security measures and crowd control—completed/ongoing
- Health and safety procedures—ongoing.

## 3.2 Purpose

This SOP provides USDA APHIS Veterinary Services (VS), IC personnel, and other official response personnel with guidance on technical and logistical surveillance procedures in poultry. The guidance in this SOP is relevant to ND outbreaks of varying sizes, whether the outbreak is isolated to a single premise or spans across a region of numerous premises because the Incident Command System (ICS) from which this SOP is based is both flexible and scalable.

These procedures serve as guidance for the Disease Surveillance Branch (Operations Section), Situation Unit (Planning Section), and other associated IC personnel involved in surveillance activities.

These are sample guidelines. This SOP provides recommendations regarding sampling sizes and sampling frequencies for premises located in the IZ, BZ, and SZ, and for providing evidence of DF for premises that do not require daily bird or product movement for business continuity (such as layer, broiler, turkey, and game birds).

Surveillance will be conducted at intervals as specified by the IC using the most current scientific information and best practice guidance available. APHIS will communicate and collaborate with public health agencies regarding the threat of ND to humans.

## 3.3 Responsibilities

At the APHIS level, the Science, Technology, and Analysis Services (STAS) and Surveillance, Preparedness, and Response Services (SPRS) design and implement surveillance plans, respectively. In the ICS, the Disease Surveillance Branch (Operations Section), in conjunction with the Situation Unit (Planning Section), are responsible for collecting, tabulating, and

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reporting surveillance information. Surveillance is designed to define the extent of the disease, detect new outbreaks, and establish disease-free zones. It is necessary to help control and contain the spread of the disease.

The number of personnel and organizational structure may vary depending on the size and complexity of the incident. The roles and responsibilities of personnel may also change throughout the incident. Large scale incidents may involve more than one premises, and may affect large geographic areas. Personnel requirements may evolve as the response progresses. All responsibilities will be designated to available and qualified personnel. The ICS structure presented here, and the responsibilities, are presented as guidance.

### 3.3.1 Disease Surveillance Branch (Operations Section) and Situation Unit (Planning Section)

Collaboratively, the cells within the Disease Surveillance Branch (Operations Section) and the Situation Unit (Planning Section) will monitor the location and boundaries of the infected poultry to detect new outbreaks and prevent the dissemination of the infectious agent. Together, these entities work in a coordinated manner to ensure adequate surveillance to support information-based decisions and to regain “ND-free” status as soon as possible. These entities have the responsibility to

- establish case definitions and classifications (such as suspect or confirmed);
- identify disease control zones (Infected, Buffer, or Surveillance);
- determine premises classifications (such as Infected, Contact, or Free);
- collect surveillance data;
- assess information;
- support requests for movement permits; and
- report on findings.

### 3.3.2 Disease Reporting Officer

The Disease Reporting Officer, in the Situation Unit (Planning Section), is responsible for coordinating surveillance activities with the cooperation of the Disease Surveillance Branch Leader (Operations Section). This individual

- directs the activities of the Disease Reporting Cell, including veterinarians, Emergency Management Response System (EMRS) data entry specialists, and other data entry personnel, as well as laboratory specialists;
- supervises the preparation, review, and entry of field investigation data, movement data, and contiguous premises data;
- supervises and organizes the orderly, efficient retrieval of routine and specialized reports from EMRS;

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- coordinates all reports of animal disease investigations and results of laboratory tests, to assure the completeness and accuracy of data entry into EMRS; and
  - cooperates with the Epidemiology Cell to summarize epidemiological information.

### 3.3.3 Disease Surveillance Branch Leader

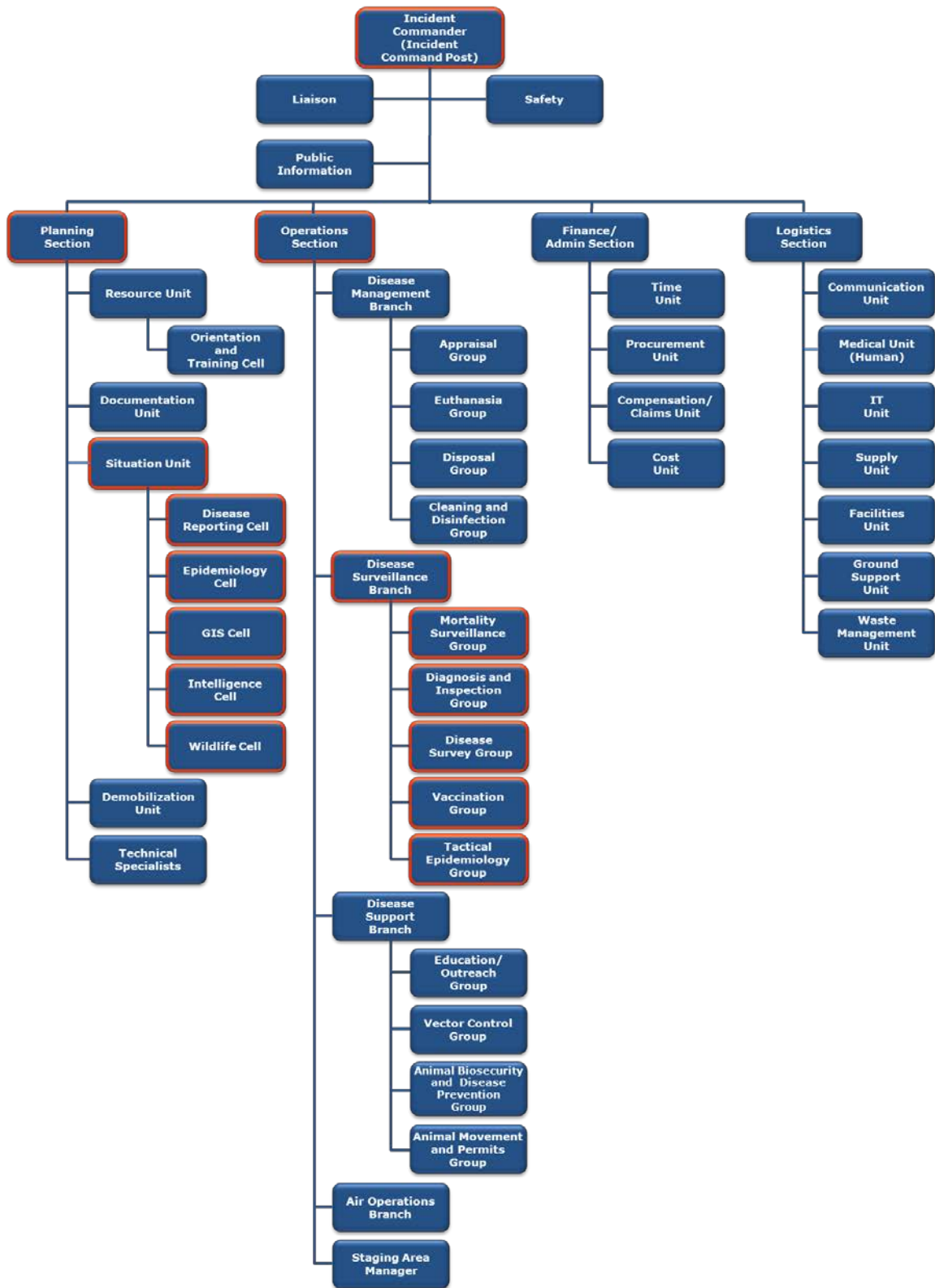
The Disease Surveillance Branch Leader (Operations Section) supervises the activities of the Disease Surveillance Branch and works in collaboration with the Disease Reporting Officer-Situation Unit in the Situation Unit (Planning Section). This individual

- supervises the activities of the Branch (Mortality Surveillance Group, Diagnosis and Inspection Group, Disease Survey Group, Vaccination Group, and Tactical Epidemiology Group), ensuring that the surveillance objectives are being achieved through the appropriate use of resources and personnel;
- assists in ensuring data entry into EMRS is coordinated, efficient, and accurate;
- assists in ensuring that samples are collected according to a surveillance plan, and in a biosecure and appropriate manner; and
- supervises the implementation of surveillance plans, particularly as they are revised throughout an outbreak, in conjunction with the Situation Unit (Planning Section).

The command structure and positions below are provided as guidance. Figure 3-1 shows an example ICS structure.



Figure 3-1. Example ICS Structure



Note: GIS = Geographical Information Systems, IT = Information Technology.

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## 3.4 Surveillance Planning at the Incident Command Post (ICP)

### 3.4.1 Surveillance Parameters

The Disease Surveillance Branch (Operations Section) in collaboration with the Situation Unit (Planning Section) is responsible, with input from other personnel as required, for developing a surveillance plan for an ND outbreak. A surveillance plan indicates the frequency, number, and distribution of birds and premises to be sampled. Surveillance plans are developed by selecting combinations and levels of the six tools listed below. Developing an ND surveillance plan requires tradeoffs to be made between these six surveillance parameters, employing initial information collected, ongoing evaluation of outbreak conditions, and best estimates to the many questions listed below. More specific guidance on a surveillance plan for an ND outbreak is found in [Attachment 3.A](#). The six surveillance parameters are:

1. *Design (threshold) prevalence*: The goal is to determine the lowest feasible prevalence that can be used to detect infected flocks on premises. The chosen proportion of birds or premises infected that if exceeded will indicate the disease has been detected for a given confidence level and population size (1 percent vs. 5 percent vs. 15 percent). Factors that influence the design prevalence choice are:
  - a. Available tests (such as visual inspection and laboratory)
    - i. The test sensitivity and specificity, and
    - ii. The turn-around time for the test results.
  - b. If visual inspection is the selected detection method, at what flock prevalence can the clinical signs be observed?
  - c. How severe are the clinical signs?
  - d. What is the prevalence of detectable infected poultry on the premises given the test selection?
  - e. How quickly will there be enough detectably infected poultry (such as those with clinical signs) so that the chosen test can detect the infected poultry?
    - i. Has the disease spread throughout the premises?
    - ii. How many birds are detectably ill?
    - iii. How long has the disease been on the premises?
2. *Confidence level*: The selected level (90 percent confident vs. 95 percent confident) that the disease can be detected for the chosen design prevalence, given the population size. Questions to consider are:
  - a. At a chosen confidence level, how many samples are required to be taken, given the number of poultry or premises?
  - b. Does sampling more premises less intensively supply more usable outbreak information than a higher confidence level sampling, where more flocks are sampled on fewer premises?

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- c. Can the same level of overall sampling confidence be achieved by more frequent sampling using a sampling scheme with lower confidence level? For example, does sampling every third day with an 85 percent confident sampling scheme equal sampling once a week with a 95 percent confident sampling scheme?
  - d. If an infected bird is easily detected early, will a sampling scheme with a lower confidence level achieve acceptable detection results?
3. *Types of tests*: Test choices—visual inspection, polymerase chain reaction testing, serology testing, etc.—and the test cutoff values can influence the design prevalence choice. Each test has a sensitivity and specificity that varies with the cutoff values. The following are questions to consider when selecting tests:
- a. What tests are available?
  - b. What are the test sensitivities (assume that this is a screening test)?
  - c. Can the test detect infection early in the disease process?
  - d. Is the test reliable and are the test results repeatable?
  - e. Is the test rapid and easy to administer?
  - f. How much labor is required to take samples of the flocks or premises?
  - g. How many trained personnel are available to administer the test or sample the flocks?
  - h. Is the disease easily transmitted by the sample taker?
  - i. What is the optimum frequency interval at which the test can be applied?
  - j. Does the sampling/testing activity seriously disrupt the normal premises work flow?
  - k. What is the cost of the tests?
4. *Sampling frequency*: Previous negative test results can augment information gained from negative test results if the time period between sampling is short—ideally daily, but definitely less than the incubation period. The value of the previous negative test results decreases as the interval between sampling increases (daily vs. every other day). The following are questions to consider when determining the frequency of sampling:
- a. How frequently should the premises in each zone (IZ, BZ, SZ and Free Area [FA]) area be inspected?
  - b. How long is the disease incubation period?
  - c. How long is the latent period?
  - d. How long is the infectious period?
  - e. How rapidly is the disease spreading through the premises?
  - f. How likely is the disease to spread to other premises?
5. *Risk-based sampling*: Selecting populations with a higher proportion of infected birds (1 percent vs. 10 percent) reduces the number of samples needed for a given confidence and population size. The following are several questions to consider:
- a. How many birds are on the farm?

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- b. Is there a high risk population (assumed higher prevalence rate) that can be sampled to reduce the sample numbers required or is a census or random sample of the premises entire population required?
6. *Sampling scheme*: Within the selected population (risk-based or total population), a random, convenience, or other scheme may be used, and the choice will influence the number of birds/premises sampled. Questions to consider when developing a sampling scheme include:
    - a. Is it possible to target a high-risk population that should have a higher ND prevalence rate, for example, sick or dead birds?
    - b. Will convenience sampling supply the same confidence level as random sampling?
    - c. Is random sampling possible?

### 3.4.2 Surveillance Plan

The surveillance plan, created based on the six criteria above, will change as new information becomes available by adjusting the combination of these six surveillance tools. It is expected that the surveillance plan will continue to evolve as new information is incorporated by IC personnel.

In an outbreak, the actions and information needed for outbreak management changes throughout the course of the outbreak. Surveillance will be ongoing during the outbreak (a continuous activity) until last the area/zone is proven disease free. The emphasis of surveillance will change during the response, from finding infected flocks to demonstrating that there aren't infected flocks/premises in an area/zone.

Ideally, every At-Risk Premises (ARP) would be tested/sampled every day, but this is impossible, given the limited resources at hand in any outbreak. The surveillance plan that is developed must ensure that information that is needed to control the outbreak is collected despite restrictions on the availability of resources. This is accomplished by choosing realistic combinations of the six surveillance parameters.

To optimize the available resources, surveillance during an outbreak will be coordinated by the Unified Command within the affected areas, with support and additional guidance as needed from APHIS and other State, Tribal, and Federal officials, or the multi-agency coordination groups as needed. STAS and SPRS design and implement surveillance plans, respectively.

The intervals between inspections or surveys will depend on the maximum observed incubation period of ND, the resources available, and the risk of exposure to susceptible flocks. Operationally, the epidemiology, tracing, and surveillance teams in the ICP will work together to accomplish the expected outcomes.

Every effort must be made to educate producers about the clinical signs of ND and to encourage them to report suspicious symptoms in poultry. A case definition for "suspect" flocks will provide clinical signs that private practitioners and people in daily contact with flocks might see. Information will be widely disseminated by the Joint Information Center explaining how producers should report suspicious findings.

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It is likely that a surveillance plan for wildlife will be implemented to determine if ND is in that population. A veterinarian or wildlife biologist trained to recognize clinical and pathological signs of the disease of concern will investigate suspect cases in wildlife within 24 hours.

For additional information to develop a specific disease response surveillance plan, see the Outbreak Surveillance Toolbox, from the USDA APHIS-VS Centers for Epidemiology and Animal Health (CEAH), available to APHIS employees at <http://inside.aphis.usda.gov/vs/ceah/nsu/toolbox/>.

### 3.4.3 Surveillance Objectives by Time Period

There are three key time segments of surveillance activity in an ND outbreak in poultry. These segments have distinct objectives and goals to aid in the control and eradication of ND from poultry.

1. *The initial 72 hours post-ND outbreak declaration:* The objective is to detect existing infected flocks and premises as quickly as possible. The goals of IC are the following:
  - a. Create the initial BZ designation and boundary of the CA.
  - b. Create a list of premises with susceptible flocks located in the CA.
  - c. Determine the boundary of the SZ and start developing a surveillance plan to be used in the SZ.
2. *The control and eradication period (from initial 72-hour period until the last case is detected and eradicated):* There are four key objectives during this period that must be accomplished simultaneously:
  - a. Detect IP, new or existing, so that control measures can be put in place.
  - b. Provide evidence that premises are free of ND, thereby permitting poultry and poultry product movements in the CA.
  - c. Evaluate the outbreak management control activities.
  - d. Provide evidence that the FA is free of disease, thereby enabling unrestricted poultry and poultry product movement.

To attain these four key objectives, the goals of IC are the following:

- a. Evaluate control measures by determining the outbreak's epidemiological curve, numbers of newly IP, and the location of the newly detected IP.
- b. Provide evidence of DF on Monitored Premises (MP) with frequent testing of populations on the premises, ideally targeting populations based on risk disease factors.
- c. Provide evidence of DF on Free Premises (FP) in the SZ and FA by sampling.
  - i. Select FP to sample, either randomly or with a risk-based selection process during the quarantine. Sample flocks from the selected premises randomly or sample a targeted population on the premises (sick birds).
- d. Reduce the size of the BZ by sampling regions that can be separated from the BZ if test results are negative.

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3. *Post eradication (quarantine)*. The objective is to prove that the CA and FA are free of disease (using World Organization for Animal Health [OIE] recommendations on surveillance). To achieve this objective, the goals of IC are the following:
    - a. Prove DF on depopulated premises (for example, limited use of sentinel birds—see [Attachment 3.D](#)).
    - b. Prove DF on ARP in the CA by random sampling or targeted sampling (choosing populations based on risk) on selected premises and selected flocks.
    - c. Prove DF in the FA, following OIE guidelines, using multiple methods including serological slaughter sampling and passive surveillance by veterinarians and the public.

### **3.5 Activities by Surveillance Personnel**

#### **3.5.1 Surveillance Team Field Protocol**

The following protocols are provided as guidance for IC Personnel in an ND outbreak that are performing surveillance activities.

##### **3.5.1.1 Before Leaving the ICP**

1. Collect all equipment and supplies needed for the day. [Attachment 3.B](#) and [Attachment 3.C](#) contain equipment lists for commercial and backyard sites respectively.
2. Obtain maps and decide on a route to the designated survey area.
3. Check the Global Positioning System (GPS) unit at the designated location.

##### **3.5.1.2 At the Time of Arrival on the Premises**

1. Wear the response team identification.
2. Park the vehicle safely on the roadside in the area to be surveyed.
3. Put on your rubber boots as you exit the vehicle. Rubber boots or foot covers (booties) should be worn.
4. Gather supplies (such as quarantine book, clipboard, quarantine signs, duct tape, cable ties, survey forms, and disinfectant spray).
5. Begin to survey the assigned area.
6. Approach the residence and knock on the door or ring the bell to contact the residents. If there is no response, do not walk around the premises in an attempt to locate the residents.
7. Use caution and common sense when entering premises. Avoid any confrontations with residents.
8. Respect any “Beware of Dog” and “No Trespassing” signs.
9. Make a note on the survey sheet if the owner was uncooperative.

##### **3.5.1.3 Objectives to Accomplish While at Each Premises**

1. Introduce yourself as members of the response team.

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2. Use an interpreter if needed to communicate with the residents.
  3. Explain the program and the reason for being at the premises. Make sure the residents understand the need for correct information for the survey.
  4. Complete the survey questionnaire as fully as possible. Add additional comments as necessary. Too much information is better than none.
  5. Use neat handwriting on your forms. Someone else will be entering this information into the database.
  6. Give information fact sheets to the residents and point out the telephone number that they can call if they have any questions or “hot tips.”
  7. Thank the residents for their cooperation and participation.
  8. If you notice birds of any kind and no one is home, complete the survey. Leave information brochures and a copy of the quarantine together and leave them in the door or gate.
  9. If sick and/or dying birds are present, call this information in to the ICP.
  10. Complete the quarantine for premises that have sick birds and leave a copy with the residents. Note any refusal to sign the quarantine.
  11. Hang quarantine signs in a conspicuous spot in appropriate languages, either with cable ties or duct tape.

#### 3.5.1.4 When Departing From the Premises

1. Walk off the premises to the Personnel Decontamination Site.
2. Stop and spray rubber boots or remove foot covers (booties) and dispose of them properly. Spray shoes with disinfectant after leaving each premises.
3. Continue to the next premises and proceed as above, or return to vehicle.

#### 3.5.1.5 When Returning to the Vehicle

1. Upon returning to the vehicle, wash your hands with an alcohol-based hand sanitizer.
2. Sit inside the car with your feet out. Spray your shoes with disinfectant before placing your feet in the car.

#### 3.5.1.6 Before Returning to the ICP at the End of the Day

1. Call the team leader to report that you have completed your task and are returning to the ICP.
2. Run your vehicle through a car wash that cleans the undercarriage. Vacuum the inside of the vehicle, and throw garbage away.

#### 3.5.1.7 Upon Return to the ICP

1. Detach the white and pink copies of the quarantine forms (if applicable), and staple the survey form on top of the white and pink copies of the quarantine form.
2. Turn surveys in to the Group Leader upon completion of the assigned task.

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3. The Group Leader is responsible for ensuring that surveys are collected from each team and for seeing that the Situation Unit in the Planning Section receives the completed surveys for data entry.
  4. Initial off on any seasonal employee timesheets.

### 3.5.1.8 The Surveillance Sample Team Procedures

1. DO NOT enter premises with dead or sick birds. If you observe dead or sick birds, leave the premises and call the Tactical Epidemiology Group.
2. A biosecurity line must be established between the premises and the vehicle. Use the biosecurity procedures and PPE outlined in the Biosecurity and Health and Safety/PPE SOP.
3. Two members of the three-person surveillance team will enter the premises. One crew member will hold and handle the bird(s). The other crewmember will collect oropharyngeal and cloacal swabs and handle Brain Heart Infusion (BHI) media tubes.
4. Oropharyngeal and cloacal swabs must be collected according to procedures outlined during training and the appropriate section in the FAD Investigation Manual.
5. The third crew member is the clean person who remains at the biosecurity line established between the premises and the vehicle. This crew member calls for the premises identification information and takes the decontaminated samples at the biosecurity line and stores them in the ice chest that will be used to transport them. This crew member also processes the trash when the other two crew members return to decontaminate at the biosecurity line prior to returning to the vehicle at the end of the collection.
6. The two crew members who collect the samples should complete the following procedures before transferring the samples across the biosecurity line to the third team member:
  - a. Complete the Flock Exam form with the owner prior to taking samples.
  - b. Confirm the Flock Exam form with the owner prior to taking samples.
  - c. Complete the Laboratory Submission form.
  - d. Attach a label to each of the Laboratory Submission forms.
  - e. Label the BHI tubes with the premises identification number, date, species (if there are multiple species on same premises), and bird owner's name.
  - f. Complete a yellow tag. Each yellow tag should include the premises identification number and the name of the bird owner. Insert the yellow tag into the bags with the BHI tubes.
  - g. Triple bag the BHI tubes.
7. Photocopy the Laboratory Submission form.
8. Summarize and turn in daily totals on the Sample Summary form to the Team Leader.

### 3.5.1.9 Waiting Period

It is important to follow appropriate biosecurity procedures while undertaking surveillance activities. Personnel should not travel directly between IP and unknown or uninfected premises.



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It is important to wait the allotted time between visits. Typically, in addition to following appropriate cleaning and disinfection protocols, personnel wait between 24–72 hours between premises visits during an ND outbreak. *The actual waiting period can be dictated by IC based on particular circumstances in the outbreak.* Team members should not travel from an IP or SP to unknown or uninfected premises. However, personnel may travel between IPs, if proper mitigating procedures are followed.

### 3.5.2 Training

Having the appropriate training is an important part of responding to an ND outbreak. There are many options for surveillance training, including AgLearn and APHIS, VS, and Professional Development Staff (PDS) Training Courses. In addition, there is substantial information on surveillance, and guidance for developing a surveillance plan in the VS Outbreak Surveillance Toolbox, available to APHIS employees at <http://inside.aphis.usda.gov/vs/ceah/nsu/toolbox/index.html>.

All of the following courses are both AgLearn and PDS Training Courses, and have surveillance components:

- *Federal and State Epidemiology Officer Course*: This course is appropriate for Federal and State Epidemiology Officers, and provides them with the tools to effectively manage and direct surveillance programs. At the end of this training, participants should know how to oversee and develop field surveillance strategies and properly evaluate field surveillance activities.
- *Field Epidemiology Training for High Priority and Program Diseases Course*: This course provides problem solving skills related to those diseases for which VS has a control, eradication, or surveillance program. At the end of this training, participants should be familiar with gathering surveillance data and applying epidemiological principles in the field, and developing and implementing herd and flock plans.
- *Program Disease Field Skills Course*: This course provides State and Federal Veterinary Medical Officers (VMOs) and Animal Health Technicians (AHTs) with the skills to effectively perform basic regulatory veterinary field skills, such as surveillance programs. At the end of training, participants will be familiar with sample submission, collection, and basic herd and flock plans.
- *Veterinary Services Careers Program (VSCP): Basic Epidemiology (AHT)*: This course is for those accepted to the VSCP curriculum, and specifically designed for AHTs to ensure they can assist VMOs in conducting epidemiological investigations and analyses of animal disease outbreaks.
- *Veterinary Services Careers Program (VSCP): Basic Epidemiology (VMO)*: This course is for those accepted to the VSCP curriculum, and is specifically designed for VMOs to ensure that newly hired VMOs possess the skill set necessary to conduct epidemiological investigations and analyze animal disease outbreaks.

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# Attachment 3.A ND Outbreak Surveillance Guidance and Rationale for Poultry<sup>1</sup>

These are updated recommendations for Newcastle disease (ND) outbreak surveillance, prepared by the Centers for Epidemiology and Animal Health (CEAH), Science, Technology, and Analysis Services (STAS), Veterinary Services (VS), Animal and Plant Health Inspection Service (APHIS). These guidelines may be updated periodically.

## Purpose

The purpose of these guidelines is to provide recommendations for surveillance activities in poultry. These are sample guidelines.

These are strategies regarding sampling sizes and sampling frequencies for premises located in the Infected Zone (IZ), Buffer Zone (BZ), Surveillance Zone (SZ) and for proof of disease freedom (DF) that do not require daily bird or product movement for business continuity (such as layer, broiler, turkey, and game birds). Business continuity surveillance schemes may apply.

## Definitions

There are four key definitions that are important in outbreak surveillance.

- *Dead Birds* are the dead or euthanized sick birds found each day in every house on a premises.
- *50-Dead-Bird Group* consists of 50 or fewer dead birds (and each multiple of 50 or fewer dead birds) from each house on the premises each day.
- *5-Bird or 11-Bird Pool* combines samples taken from five or eleven dead or euthanized sick birds out of the house's (flock's) daily dead birds into one sample.
- *Detection Probability* the sampling scheme will detect at least one infected bird of each 50-dead-bird group (at the 95 percent confidence level) if there are 20 or more infected birds (40 percent prevalence) in the target population of daily dead birds, where the Fusion-gene (F-gene) real-time reverse transcriptase polymerase chain reaction (rRT-PCR) test sensitivity of the 5-bird pool is 85.1 percent.

## Rationale for the 20-Bird Detection Prevalence

The following reasons provide the rationale for the 20-bird detection prevalence threshold:

- This is used as basic surveillance in the Highly Contagious Disease Plan, and starts immediately **after ND outbreak response authorization**.
- It is rapidly exceeded because ND quickly spreads throughout a house, killing many birds.
- It is logistically feasible, flexible, simple, and standardized.

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<sup>1</sup> This guidance is also found in the appendices of the ND Response Plan: The Red Book.

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- Is consistent with surveillance schemes used for disease detection, business continuity, and proof of DF.

## Sampling Scheme Procedures for Poultry

1. Start sampling immediately upon ND outbreak response authorization.
2. Implement disease detection sampling schemes.

## Surveillance Sampling Schemes

The following sampling unit is used for both commercial and backyard premises:

- *Sampling unit:* Flock or house.
- *Sample:* A pooled sample that combines swabs taken from five or eleven dead or euthanized sick birds out of the house's (flock's) daily dead or ill birds.
  - The frequency recommendations for premises that are not moving birds daily are based on
    - the incubation period (2-15 days; likely incubation period of virulent ND is 2-6 days<sup>2</sup>).<sup>3</sup> Sampling should be based on the mean incubation period observed;
    - sufficient available personnel for surveillance activities;
    - decreased probability of spreading ND with frequent inspection due to earlier detection of ND;
    - recommendations for changing frequency of premises inspection/sampling (listed in Table 3A-3 of this Attachment); and
    - recommendations for sampling frequency of live birds without clinical signs, in instances where flock sizes are small and daily mortality is limited (listed in Table 3A-4 of this Attachment).

## Disease Detection Surveillance Scheme

This information is also summarized in Table 3A-1.

### Commercial Premises

#### Infected Zone

- Census of premises within zone; sample premises as prioritized by epidemiological investigation and continuity of business requirements.
- If ND compatible signs are observed or epidemiological links found, collect swabs for the 5-bird or 11-bird pool(s) from each 50-dead-bird group from each flock on the premises.
- Sampling frequency:

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<sup>2</sup> A.R. Spickler, J.A. Roth, J. Gaylon, and J. Lofstedt (Eds). 2009. *Emerging and Exotic Diseases of Animals*, 4<sup>th</sup> Ed. Ames, IA: Center for Food Security and Public Health, Iowa State University.

<sup>3</sup> OIE incubation period for ND is 21 days. OIE. 2011. *Terrestrial Animal Health Code*. Chapter 10.9: Newcastle Disease. <http://www.oie.int>.

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- Contact Premises (CP), Suspect Premises (SP), and Monitored Premises (MP):
    1. Collect swabs for the 5-bird or 11-bird pool sample(s) on each premises 2 times per week for 28 days. If the mean or median incubation period is observed to be 3 days or less, the sampling frequency should be increased; if the mean or median incubation period is 6 days or more, the sampling frequency may be decreased (see Table 3A-3).
    2. CP, SP, or MP that test negative in the above sampling regime should then be sampled as described for At-Risk Premises (ARP).
    3. MP may be sampled more frequently depending on the need to ship product, but at the minimum must be sampled as listed above.
  - ARP:
    - Collect swabs for the 5-bird or 11-bird pool(s) on each premises once every 5 days for the duration of the quarantine.

### Buffer Zone

- Census of premises within zone; sample premises as prioritized by epidemiological investigation and continuity of business requirements.
- Sampling frequency:
  - MP, CP, SP:
    1. Collect swabs for the 5-bird or 11-bird pool sample(s) on each premises 2 times per week for 28 days. If the mean or median incubation period is observed to be 3 days or less, the sampling frequency should be increased; if the mean or median incubation period is 6 days or more, the sampling frequency may be decreased (see Table 3A-3).
    2. MP, CP, or SP that test negative in the above sampling regime should then be sampled as described for ARP.
    3. MP may be sampled more frequently depending on the need to ship product, but at the minimum must be sampled as listed above.
  - ARP:
    - Collect swabs for the 5-bird or 11-bird pool(s) on each premises once every 5 days for the duration of the quarantine.<sup>4</sup>

### Surveillance Zone

- Number of premises to be sampled:
  - Calculate the number of premises to be sampled using the sample size calculators located in the Outbreak Surveillance Toolbox<sup>5</sup> or Cannon formula.

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<sup>4</sup> The ARP in the BZ and IZ are sampled with the same frequency because infected but undetected premises in the BZ have higher consequences when not detected than those in the IZ (See #11 in Assumptions).

<sup>5</sup> Available from <http://inside.aphis.usda.gov/vs/ceah/nsu/toolbox/index.html> (for APHIS employees).

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- The number of premises to be sampled is based on detecting at least one Infected Premises (IP) with 95 percent confidence, where
    - the IP prevalence equals or exceeds 5 percent of all premises with susceptible birds,
    - or a census, if the number of premises within the zone is small, and
    - in order as prioritized by epidemiological investigation and continuity of business requirements.
  - Sampling frequency:
    - Randomly select the calculated number of premises to be sampled (as determined above, such as 60), and collect swabs for the 5-bird or 11-bird pool(s) on each of the selected premises once during the first 3-week period of the quarantine.
    - Randomly select (include in the sampling list the premises sampled in the first 3-week period) and sample an equal number of premises (as calculated above) once during each additional 3-week period of the quarantine. For example, randomly select and sample 60 premises once during the first 3-week period, then reselect (with replacement) another 60 premises to be sampled in the second 3-week period for the duration of quarantine.

## Backyard Premises

The same sampling unit and sample is used in backyard premises as in commercial premises.

## Infected Zone

- Census of premises within zone; sample premises as prioritized by epidemiological investigation and continuity of business requirements.
- Observe the flock for ND compatible signs.
- If ND compatible signs are observed or epidemiological links found: collect swabs for the 5-bird and 11-bird pool(s) from each 50-dead-bird group from each flock on the premises (most backyard flocks have less than 50 birds, thereby requiring one 5-bird or 11-bird pool).
- Observation/sampling frequency:
  - CP and SP:
    1. Observe entire flock for ND signs (swab if there are any ND signs or epidemiological links found) 2 times per week for 28 days.
      - a. Frequency of observation/sampling depends on available personnel, number of premises to be sampled, owner resistance (hostility), and other factors.
      - b. The Incident Commander must balance premises' transmission risks and detection costs in deciding on observation/sampling frequency.

- 
2. CP and SP that test negative or that have no signs of ND or epidemiological links found in the above observation/sampling regime should then be observed as described for ARP.

- ARP:
  - Observe entire flock (swab if there are ND signs or epidemiological links) on each premises once every 5 days for the duration of the quarantine.

### Buffer Zone

- Census of premises within zone; sample premises as prioritized by epidemiological investigation and continuity of business requirements.
- Observe the flock for ND compatible signs.
- If ND compatible signs are observed or epidemiological links found, collect swabs for the 5-bird or 11-bird pool from each 50-dead-bird group from each flock on the premises.
- Observation/sampling frequency:
  - CP and SP:
    - Observe entire flock for ND signs (swab if there are any ND signs or epidemiological links) 2 times per week for 28 days.
    - CP and SP that test negative or that have no signs of ND in the above observation/sampling regime should then be observed as described for ARP.
  - ARP:
    - Observe entire flock (swab if there are ND signs or epidemiological links) on each premises once every 5 days for the duration of the quarantine.

### Surveillance Zone

- Observe the flock for ND compatible signs.
- If ND compatible signs are observed or epidemiological links found, collect swabs for the 5-bird or 11-bird pool from the dead birds in each flock on the premises.
- Number of premises to be observed/sampled:
  - Calculate the number of premises to be observed/sampled using the sample size calculators located in the Outbreak Surveillance Toolbox or Cannon formula.
  - The number of premises to be observed/sampled is based on detecting at least one IP with 95 percent confidence, where
    - the IP prevalence equals or exceeds 5 percent of all premises with susceptible birds,
    - or a census, if the number of premises within the zone is small, and
    - in order as prioritized by epidemiological investigation and continuity of business requirements.

- 
- Sampling frequency:
    - Randomly select the calculated number of premises to be observed/sampled (as determined above, such as 60), and swab the dead or euthanized sick birds on each of the selected premises once during the first 3-week period of quarantine.
    - Randomly reselect (include the premises observed/sampled in the first 3-week period in the sampling list frame) and sample an equal number of premises (as calculated above) once during each additional 3-week period of the quarantine. For example, randomly select and observe/sample 60 premises once during the first 3-week period, then reselect (with replacement) another 60 premises to be observed/sampled in each subsequent 3-week period for the duration of the quarantine.

## **Proof of Disease Freedom Surveillance Scheme**

The definitions of “dead birds,” “50-dead-bird group,” “5-bird or 11-bird pool,” and “detection probability” remain the same. Also see Table 3A-2 which summarizes proof of DF surveillance for ND in poultry.

- Surveillance for proof of DF starts 21 days (World Organization for Animal Health [OIE] incubation period, as this is the international standard) after depopulation of last IP and is in effect for 3 months per OIE.
- The goal is to identify sero-positive farms that lack clinical signs. Clinically ill flocks will be detected via increased surveillance methods listed below and investigation of flocks with suspicious signs.
- OIE recommends intensifying surveillance schemes in conjunction with surveillance of the CA. In a U.S. ND outbreak, this may be conducted by
  - actively investigating flocks with suspicious clinical signs,
  - increasing slaughter sero-surveillance, and
  - considering the limited use of sentinel flocks in specific circumstances.<sup>6</sup>

## **Commercial Premises Disease Freedom**

### **Infected Zone, Buffer Zone, and Surveillance Zone as One Unit**

- Number of samples per flock:
  - Calculate the number of premises to sample using the sample size calculators located in the Outbreak Surveillance Toolbox or Cannon formula.
  - The number of premises to be sampled is based on detecting at least one IP with 95 percent confidence, where
    - the IP prevalence equals or exceeds 5 percent where the maximum birds sampled doesn't exceed 60 birds per flock, and

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<sup>6</sup> For more on sentinel flocks, see B.J. McCluskey, B. Burgess, J. Glover, H. Kinde, and S. Hietala. 2006. “Use of sentinel chickens to evaluate the effectiveness of cleaning and disinfection procedures in noncommercial poultry operations infected with exotic Newcastle disease virus.” *J Vet Diagn Invest.* 18, 296-299.

- 
- one 5-bird or 11-bird pool sample is submitted for each 50-dead-bird group.
  - Number of premises to be sampled (serology and swabs of dead and euthanized sick birds):
    - Calculate the number of premises to sample using the sample size calculators located in the Outbreak Surveillance Toolbox or Cannon formula.
    - The number of premises to be sampled is based on detecting at least one IP with 95 percent confidence, where
      - the IP prevalence equals or exceeds 5 percent of all premises with susceptible birds in the IZ.
  - Sampling Frequency:
    - Sample the number of premises calculated above (for example, 60 premises) once per month for 3 months after the last positive test result or completion of depopulation.

## Backyard Premises Disease Freedom

### Infected Zone, Buffer Zone, and Surveillance Zone as One Unit

- Number of samples per flock:
  - Calculate the number of premises to sample using the sample size calculators located in the Outbreak Surveillance Toolbox or Cannon formula.
  - The number of premises to be sampled is based on detecting at least one Infected Premises with 95 percent confidence, where
    - the IP prevalence equals or exceeds 5 percent where the maximum birds sampled doesn't exceed 60 birds per flock, and
    - one 5-bird or 11-bird pool sample submitted for each 50-dead-bird group.
- Number of premises to be sampled (serology and swabs of dead and euthanized sick birds):
  - Calculate the number of premises to sample using the sample size calculators located in the Outbreak Surveillance Toolbox or Cannon formula.
  - The number of premises to be sampled is based on detecting at least one IP with 95 percent confidence, where
    - the IP prevalence equals or exceeds 5 percent of all premises with susceptible birds in the IZ.
- Sampling Frequency:
  - Sample the number of premises calculated above (for example, 60 premises) once per month for 3 months after the last positive test result or completion of depopulation.

## Surveillance for Bird/Product (Non-Daily Movement Requirement)

- Inspect/sample premises located in the IZ or BZ that wish to move birds or products.



- The three steps following are required prior to bird/product movement:
  1. Two, consecutive, negative 5-bird or 11-bird pool tests of birds to be moved or of the birds that produced the products to be moved.
  2. Sample (swab) immediately prior to moving product. For example, start sampling 3 days before product movement if 24 hours are required before receiving test results or 2 days if test results will be received on the day of testing.
  3. Visual inspection of birds in all houses on premises for 2 consecutive days including the day before and day of movement.

## Further Surveillance Information

Table 3A-1 summarizes the outbreak surveillance scheme for disease detection.

**Table 3A-1. Outbreak Surveillance for Disease Detection**

Disease Detection						
Post Outbreak Response Authorization						
	Commercial			Backyard		
Sampling	Infected Zone	Buffer Zone	Surveillance Zone <sup>a</sup>	Infected Zone	Buffer Zone	Surveillance Zone <sup>a</sup>
Number of Premises	Census	Census	5% Prevalence Threshold <sup>o</sup>	Census	Census	5% Prevalence Threshold <sup>o</sup>
Unit*	5- or 11-bird Pool	5- or 11-bird Pool	5- or 11-bird Pool	Observation then 5- or 11-bird Pool <sup>^</sup>	Observation then 5- or 11-bird Pool <sup>^</sup>	Observation then 5- or 11-bird Pool <sup>^</sup>
<b>Frequency</b>						
Free Premises	-		21 Days	-		21 Days
Monitored Premises	Two times per week for 28 days.		-	-		-
At-Risk Premises	5 Days <sup>#</sup>		-	5 Days <sup>#</sup>		-
Contact and Suspect Premises <sup>a</sup>	Two times per week for 28 days.		-	Two times per week for 28 days.		-
Product Movement	2 consecutive negative tests <sup>@</sup>			2 consecutive negative tests <sup>@</sup>		

<sup>a</sup> Suspect Premises in a Surveillance Zone will be subject to surveillance procedures and diagnostic testing as indicated by relevant authorities.

\* Sampling Unit used in all Surveillance Schemes: One 5-bird or 11-bird pool (pooled swabs from five or eleven dead or euthanized sick birds) selected from each group of 50 or less daily dead or euthanized sick birds (and for each multiple of 50 or less dead or euthanized sick birds).

<sup>o</sup> Prevalence threshold is a predetermined proportion of Infected Premises (for example, 5 percent) used to calculate the number of premises to be sampled at a specific confidence level (for example, 95 percent) in a population of a given size (for example, 1,000 premises) based on detecting at least one Infected Premises.

<sup>^</sup> Initial visual observation only, swab upon observation of ND compatible signs. If the Incident Command thinks that the flock needs sampling based on epidemiological information, they may also sample the flock.

<sup>#</sup> Identical frequency of sampling in the Infected Zone and Buffer Zone due to the need to detect undetected but Infected Premises in the Buffer Zone due to the high consequences of undetected Infected Premises in the Buffer Zone.

<sup>@</sup> Two consecutive negative 5-bird or 11-bird pool test are required before movement of birds or of the birds that produced the product to be moved to achieve the 95 percent confidence level of detecting at least one infected 5-bird or pool.

Table 3A-2 shows the surveillance requirements to prove ND-freedom.

**Table 3A-2. Surveillance for Proof of Disease Freedom**

Proof of Disease Freedom <sup>^</sup>						
Post Outbreak Eradication						
	Commercial			Backyard		
Sampling	Infected Zone <sup>§</sup>	Buffer Zone <sup>§</sup>	Surveillance Zone <sup>§</sup>	Infected Zone <sup>§</sup>	Buffer Zone <sup>§</sup>	Surveillance Zone <sup>§</sup>
Number of Serology Samples per Premises	5% Prevalence Threshold <sup>&amp;</sup>	5% Prevalence Threshold <sup>&amp;</sup>	5% Prevalence Threshold <sup>&amp;</sup>	5% Prevalence Threshold <sup>&amp;</sup>	5% Prevalence Threshold <sup>&amp;</sup>	5% Prevalence Threshold <sup>&amp;</sup>
Number of Premises	5% Prevalence Threshold <sup>o</sup>	5% Prevalence Threshold <sup>o</sup>	5% Prevalence Threshold <sup>o</sup>	5% Prevalence Threshold <sup>o</sup>	5% Prevalence Threshold <sup>o</sup>	5% Prevalence Threshold <sup>o</sup>
Unit <sup>*</sup>	5- or 11-bird Pool	5- or 11-bird Pool	5- or 11-bird Pool	Observation 5- or 11-bird Pool	Observation 5- or 11-bird Pool	Observation 5- or 11-bird Pool
<b>Frequency</b>	Sample each premises of the Calculated Number of Premises once per month for 3 months after the last positive test result.					

<sup>^</sup> Sero-surveillance conducted in the area to be proved disease free in addition to dead bird sampling.

<sup>§</sup> Infected, Buffer, and Surveillance Zones combine as one unit for proof of disease freedom.

<sup>&</sup> Number of birds sero-sampled based on 5 percent prevalence in flock at the 95 percent confidence level where the maximum number of birds sampled per house does not exceed 60 birds.

<sup>o</sup> Prevalence threshold is a predetermined proportion of Infected Premises (e.g., 5 percent) used to calculate the number of premises to be sampled at a specific confidence level (e.g. 95 percent) in a population of a given size (for example, 1,000 premises) based on detecting at least one Infected Premises. A census of the premises in a zone will be sampled if there are few premises. Sample premises in order as by epidemiological investigation and continuity of business requirements.

\* Sampling Unit used in all Surveillance Schemes: One (1) 5- or 11-bird pool (pooled swabs from five or eleven dead or euthanized sick birds) selected from each group of 50 or less daily dead or euthanized birds (and for each multiple of 50 or less dead or euthanized sick birds).

Table 3A-3 shows the complexity of sampling based on the incubation period of the ND virus and feasible sampling frequency.

**Table 3A-3. Influence of Incubation Period on Feasible Sample Collection Frequency**

<b>Estimated Incubation Period Based on Field Information*</b>			
Incubation Period	Frequency of Sampling (days between sampling)		Sampling Duration (one week minimum)
	Minimum (Days)	Maximum (Days)	Days
1–2 days	1	1	28
3–4 days	2	3	28
5–7 days	4	6	28
8–14 days	7	10	28
> 14 days	10		28

Table 3A-4 shows the number of live birds that need to be sampled (the sample size) in order to detect at least one infected bird with 95 percent confidence assuming that exposure to the virus has been at least 3, 7, or 10 days past (as indicated in the table).

**Table 3A-4. Sampling Frequency for Live Birds without Clinical Signs  
(with 95 Percent Confidence)**

<b>Sample size on day 3, 7, 10 after exposure</b>			
<b>flock size</b>	<b>day 3</b>	<b>day 7</b>	<b>day 10</b>
10	4	1	1
20	8	2	1
30	12	2	1
50	20	2	2
100	40	5	2
200	80	11	2
400	160	22	4
500	200	28	5
600	240	33	7
800	320	44	9
1,000	401	56	11
2,000	802	113	23
3,000	1203	170	36
4,000	1604	227	48
5,000	2006	284	60

These estimates are based on a Reed-Frost transmission model where contact rate is defined as the 5<sup>th</sup> percentile of an expert opinion distribution [RiskPert(2.1,4.7,10.4)]<sup>7</sup> (i.e., having 95 percent confidence that the disease would have progressed to the point that enough birds would shed virus to allow detection of at least one if the test diagnostic sensitivity is 95 percent or greater.) The calculation is based on approximation of the hypergeometric distribution<sup>8</sup> assuming 0 positive detected out of the sample size shown above, where the number of birds shedding or dead are equal to the output of the transmission model.

<sup>7</sup> National A.I. Surveillance Plan, APHIS, December 15, 2006

<sup>8</sup> Cannon, R. M., and R. T. Roe, 1982: Livestock Disease Surveys: A Field Manual for Veterinarians. Australian Bureau of Animal Health, Canberra. Also see Cannon, R.M. 2011. Sense and Sensitivity-Designing Surveys Based on an Imperfect Test. *Preventive Veterinary Medicine*, 49, 141-163.

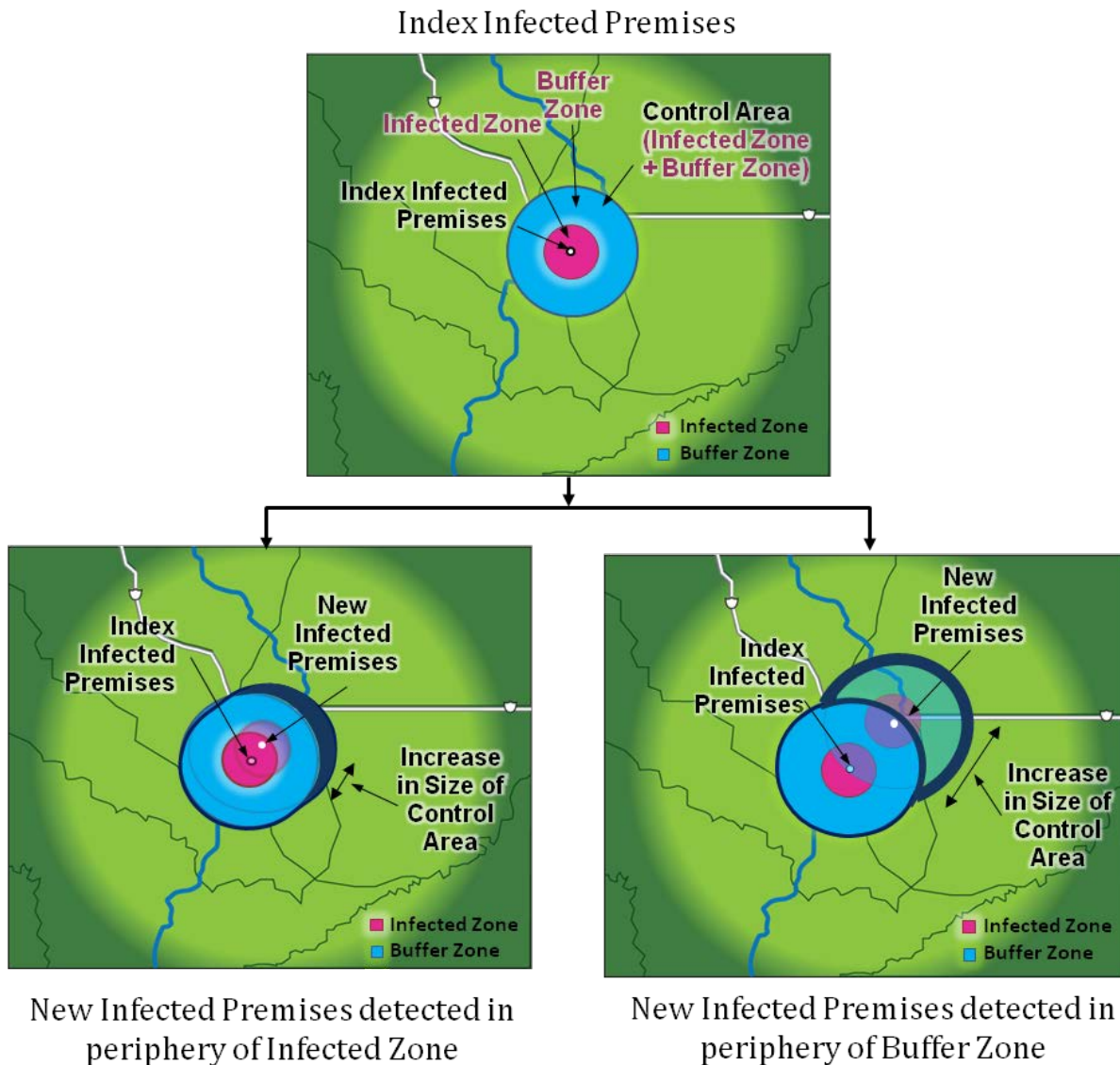
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## Assumptions for Surveillance Schemes

1. The 5-bird pool F-gene rRT-PCR assay sensitivity is 85.1 percent.
2. Confidence level: The probability of detecting at least one infected bird in the target population is 97.9 percent, which is limited by the sensitivity of the matrix assay on the 5-bird pool.
3. ND infected birds die within 2 – 15 days post infection and rapidly infects the flock, thereby increasing the probability of quickly detecting IP.
4. In commercial premises, the producer detects, collects, and places all dead birds into the target population from which the 5-bird or 11-bird pool is drawn.
5. The 20 infected ND bird prevalence threshold for each 50-dead-bird group is reached early in the disease spread in a house and is a logical feasible sample size.
6. All ND infected birds are included in each house's daily dead bird target population.
7. Outbreak response field personnel visiting backyard premises, with observation, will detect ill birds with ND compatible signs.
8. The majority of backyard flocks have less than 100 birds; sampling frequently and sampling the daily dead birds maximizes the probability of detection, minimizes the trauma and disruption to the owner, and increases efficiency because less time will be spent capturing live birds.
9. Sampling a 5-bird or 11-bird pool per 50 dead birds will sample a majority of daily dead birds in commercial broiler operations, commercial turkey premises, and backyard premises, because the dead bird number varies from 5.1 to 27 birds per day (see daily death rate and house sizes of commercial producers in the Updated Background Information section below).
10. Production parameters will be monitored for indications of ND intrusion.
11. The consequences of an infected but undetected premises is greater if it is located at the periphery of the BZ vs. the periphery of the IZ:
  - a. Increased opportunity of disease spread due to less stringent movement requirements in the BZ.
  - b. Increased difficulty of surveillance.
    - i. A larger number of ARP that require sampling.
    - ii. A larger geographic area over which to sample ARP.
  - c. Increased size of the CA: An IP will increase the size of the CA by the radius of the IZ. However, if the newly detected IP is located on the periphery of the BZ, the size of the CA will increase by the radius of the IZ and the BZ.

Figure 3A-1 shows that the size of the CA depends on where the new IP is located.

Figure 3A-1. Infected Premises' Effect on Size of Control Area



### Updated Background Information

- *Daily Mortality Rate:* The expected daily death rate ranges from 0.00051 (5.1/10,000) in hen turkeys to 0.00079 (7.9/10,000) in tom turkeys and a high of 0.00086 (8.6/10,000) in broilers per house. The daily death rate is higher in “meat type” poultry than in layers, where the daily death rate varies from 0.0001 to 0.0005. Major factors influencing the daily mortality rate are: bird strain, bird age (early, mid, or late cycle), and house construction design and age.
- *House Size:* The number of birds per house varies from 7,000 in tom turkeys to 10,000 in hen turkeys, but a high of 27,000 broilers per house. In layers, house sizes of 300,000 to 350,000 birds have become the norm.

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- *Expected Daily Mortality*: Using information supplied above, the estimated number of expected dead birds per day in commercial houses varies from 5.0 to 5.5 birds per day in turkey flocks to 23 birds per day in broiler flocks. The numbers of dead birds/day that are expected to signal that producers take “diagnostic action” are 20 hen turkeys, 14 tom turkeys, and 47 broilers, all the numbers of “expected” daily dead birds on which surveillance calculations are based are 40 percent or less of the “diagnostic action” numbers of dead birds.
  - *Recommendations*: Test one 5-bird or 11-bird pool for every 50-dead-bird groups using the sampling schemes detailed in Table 3A-1 and Table 3A-2.

## References for this Attachment

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The “United Egg Producers” ([www.uepcertified.org](http://www.uepcertified.org) and [www.unitedegg.org](http://www.unitedegg.org)).

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## Attachment 3.B Commercial Site Surveillance Equipment List

The surveillance teams needs the following supplies:

- Two 5-gallon water jugs (filled with water)
- One garden sprayer
- Tub of appropriate disinfectant
- Disinfectant sprayer
- Three plastic coolers
- Large plastic bags
- Box of zip-lock bags
- Duct tape
- Sponge
- Bucket
- Safety triangles
- Plastic container for water jugs, sprayer, and bucket
- Two felt-tip markers
- Pens
- Clipboard
- Laboratory submission forms
- Maps
- Flashlight
- Cell phone
- Biosecurity clothing pack (note size), containing one Tyvek suit, two Tyvek boots, dust mask, one bonnet, and two pairs of exam gloves
- Two bottles of waterless hand cleaner
- One roll of paper towels
- Drinking water.

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## Attachment 3.C Backyard Site Surveillance Equipment List

The surveillance teams needs the following supplies:

- Task assignment
- Maps (county and task)
- Global Positioning System (GPS) unit
- Extra batteries for GPS unit
- Newcastle disease (ND) information brochures
- Survey forms
- Quarantine forms
- Clipboards
- Appropriate personal protective equipment (PPE) (see Health and Safety/PPE SOP)
- Rubber boots
- Disinfectant sprayer
- Disinfectant
- Waterless hand cleaner
- Paper towels
- Quarantine signs in plastic sleeves (in multiple languages if needed)
- Duct tape
- Scissors
- Plastic cable ties
- Stapler
- Highlighter
- Pens
- Response personnel phone numbers
- Biosecurity measures
- Garbage bags
- Emergency medical facilities for USDA staff
- Official vehicle identification (to be removed at the end of the day)
- Bag to carry quarantine signs and informational brochures, scissors, tape, etc.



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- Flashlight
  - Cell phone
  - Gatorade or water to drink
  - Plastic cooler
  - Vehicle accident report kit
  - Rubber bands or a binder clip to keep papers together.

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# Attachment 3.D Sentinel Bird Program

## Procedure for Obtaining Sentinel Birds

1. Prospective sentinel birds must be healthy, unvaccinated against Newcastle disease (ND), old enough to ensure good survivability, and tested for ND antibodies prior to placement with the exception of Specific Pathogen Free birds.
2. Sentinel birds will be ordered from a provider specified by Incident Command. Specific contact and point of pick up information will be provided.
3. Only “clean” personnel will handle birds. Response team personnel handling sentinel birds should wear protective clothing.
4. All equipment used with sentinel birds, including but not limited to cages, transport boxes, feeders, and waterers, must be cleaned and disinfected.
5. Clean feeders, waterers, and shavings will be placed for the birds prior to their arrival.

## Procedures for Selecting Premises for Sentinel Birds

1. Sentinel birds will be placed on selected backyard Infected and Contact Premises. The decision to place sentinels on other premises depends on a premises’ type and location, an owners’ willingness not to repopulate for at least 90 days, and the effectiveness of cleaning and disinfection on a premise.
2. Sentinel birds may be placed no sooner than 21 days after cleaning and disinfection has been completed. There should be no free roaming chickens left in the area.
3. Program managers will perform the daily download of the sentinel bird database to keep the system updated and to remain aware of all premises that have had final inspections performed following cleaning and disinfection.
4. Program managers will add area queries as needed depending on where the new premises added to the database come from.
5. Program managers will act as liaisons with epidemiologists. They will share area information from the queries with epidemiologists so that they know what areas are under consideration for sentinel placement. Response team epidemiologists will know when an area may be considered for repopulation with sentinel birds. They will also be aware of special problems.
6. Program managers will act as liaisons with the Operations Section. That group will be aware of special problems dealing with the physical layout of the facilities.
7. Premises will be mapped by the Disease Surveillance Branch in the Operations Section in coordination with the Situation Unit. The interior (rooms, stalls, etc.) of each house will be mapped. Program managers will send sentinel bird crews to prospective premises (at least 1 week after final cleaning and disinfection inspection) to perform pre-placement surveys. Crews will ensure that premises are accurately diagrammed; these diagrams will be essential in determining how many sentinels will be placed on the premises, and at which locations. Crews will also need to note the cleanliness of the premises and their impression of the effectiveness of cleaning and disinfection.

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## Procedure for Placing Sentinel Birds on Premises

1. Program managers will calculate the number of birds for each premise. The number of birds to be placed on each individual premises will be determined on a case-by-case basis by the epidemiology group. Open premises that had free-running chickens require a minimum of five birds placed in cages. Premises with houses require a minimum of three birds per room. For example, premises with two horse barns containing six stalls in each would require 36 birds. If conditions permit, birds may be given free access to the interior of the rooms. That is, cages may be left open, and birds just placed in the room. If there are no doors, etc., birds may need to be placed in cages and moved from cage to cage each day. In addition, at least five birds in cages will be placed on the premises outside of the buildings in such a manner as to prevent predation.
2. Program managers will place wing bands on the birds, and record the tag numbers used for each premises in the tracking database.
3. Clean and secure housing will be required to maintain the birds from the time that they are delivered to the response team until they are placed on premises. Biosecurity standard operating procedures will be followed when response team personnel handle and transport the birds.
4. Clean and secure transport to premises will be required for the birds.
5. Wire cages will be provided as needed for individual premises.
6. Feed and water for the birds at each premises will be assured.
7. Premises owners will have their duties explicitly outlined. A cooperative agreement and compensation package will be detailed. That agreement will specify the following: owners will feed and water the birds if possible; owners will move the birds around the premises as specified; owners will report any signs of disease in birds as it occurs, and every week if the birds remain healthy; owners will allow response team inspectors access to the birds at any time; owners will agree that birds will be collected at the end of the sentinel surveillance period, and will not be given to them.
8. Program managers will place the birds in plastic coops labeled for each premises.
9. Response team members will deliver birds to selected premises. A leased box truck is exclusively available to deliver birds.
10. Response team members will place birds in planned locations.
11. Those placing the birds will leave adequate feed for a week, and leave a procedure handout with the owner after reviewing it with them using an interpreter as needed.

## Procedures Following the Placement of Sentinel Birds

1. Premises owners will monitor the health of sentinel birds, if owners agree to conscientiously report disease. If monitoring is performed by owners, response team members will conduct random oversight. Bird health should be monitored by response team personnel at least once per week. Sick or dead birds need to be promptly picked up and submitted to the laboratory for diagnostics by the operations group.

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2. Program managers will work to monitor the birds and will enter owner telephone reports into the database.
  3. Program managers will dispatch crews to premises periodically to visually inspect the birds, to feed and water them as needed (some owners refuse to care for the birds), and to deliver additional feed as needed.
  4. Feed is purchased locally (this item should specify the name of the feed store, the address, and the telephone number).
  5. Program managers will record inspection results in the database and the Emergency Management Response System (EMRS).
  6. Any dead birds will be bagged for transport to the laboratory. Surviving birds will be submitted to the laboratory after the sentinel period is completed for diagnostics.
  7. The sentinel program will be terminated for a given premises if birds survive the 21-day test period.
  8. Program managers will collect oropharyngeal swabs and blood samples from the birds for submission to the laboratory. If more than 30 birds are located on premises, a statistically valid sample of birds may be collected.
  9. Program managers will record the number of birds remaining.

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## Attachment 3.E Abbreviations

AHT	Animal Health Technician
APHIS	Animal and Plant Health Inspection Service
ARP	At-Risk Premises
BHI	Brain Heart Infusion
BZ	Buffer Zone
CA	Control Area
CEAH	Centers for Epidemiology and Animal Health
CP	Contact Premises
DF	disease freedom
EMRS	Emergency Management Response System
FA	Free Area
FAD PReP	Foreign Animal Disease Preparedness and Response Plan
F-gene	Fusion-gene
FP	Free Premises
GIS	geographic information system
GPS	global positioning system
IC	Incident Command
ICP	Incident Command Post
ICS	Incident Command System
IP	Infected Premises
IZ	Infected Zone
MP	Monitored Premises
NAHEMS	National Animal Health Emergency Management System
ND	Newcastle disease
OIE	World Organization for Animal Health
PDS	Professional Development Staff
PPE	personal protective equipment
rRT-PCR	real-time reverse transcriptase polymerase chain reaction

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SOP	standard operating procedure
SP	Suspect Premises
SPRS	Surveillance, Preparedness, and Response Services
STAS	Science, Technology, and Analysis Services
SZ	Surveillance Zone
USDA	U.S. Department of Agriculture
VMO	Veterinary Medical Officer
VS	Veterinary Services
VSCP	Veterinary Services Careers Program