

Master of Public Health
Integrative Learning Experience Report

***Knowledge, attitudes, and practices among Florida bird
rehabilitators regarding Highly Pathogenic Avian Influenza
(HPAI) H5N1***

by

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MASTER OF PUBLIC HEALTH

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Summary

Highly pathogenic avian influenza (HPAI) type A (H5N1), also colloquially known as “Bird Flu,” is a highly contagious zoonotic viral disease of birds. First identified in a goose in China in 1996, HPAI A(H5N1), referred to as HPAI H5N1, crossed over to humans with the first case reported in Hong Kong in 1997. Since these initial cases, scientists have identified HPAI H5N1 in North America, Europe, Africa, the Middle East, and Asia. The first case of HPAI H5N1 in the United States occurred in 2015 in waterfowl. The current outbreak of HPAI H5N1 started at the end of 2020 and is responsible for the culling deaths (euthanasia) of nearly 60 million birds in the United States and another 50 million birds in Europe, has been identified in 47 states, and has infected over 20 different mammals in addition to humans. Veterinarians in Florida first detected HPAI H5N1 in January 2022 from a hunter-harvested, blue-winged teal in Palm Beach County, and they have now identified the virus in over 2,000 wild birds in 37 counties across Florida. In Florida, there have been no human fatalities to date, and no commercial poultry operations have had an outbreak, yet influenza viruses easily mutate, and it is one mutation away from a variant that could be deadly to more birds, animals, and humans. One of the most exposed human populations in Florida to HPAI H5N1 are wildlife rehabilitators, especially avian rehabilitators. Because of this potential risk for exposure to HPAI H5N1 to avian rehabilitators, the Florida Commission of Wildlife (FWC) has taken increased measures to educate this population of individuals to reduce their risk of exposure and to reduce the risk of inadvertent spread of HPAI H5N1 in avian rehabilitation facilities. A first-in-kind survey of avian rehabilitation facilities was conducted in the summer of 2023 to assess the knowledge, attitudes, and practices among Florida bird rehabilitators regarding HPAI H5N1 to better inform the FWC on what information needs to be conveyed to this cohort of individuals, how this group prefers to receive its training and education, and what limitations exist for this group regarding protection of their employees, the birds in their care, and other birds with whom they might potentially contact.

Subject Keywords: Highly Pathogenic Avian Influenza H5N1, Avian Rehabilitators, Infectious Disease, Zoonotic, Wildlife

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Chapter 1 - Background

Avian influenza has been a disease of economic importance in the United States and around the world since it first appeared in Asia at the start of an outbreak in a human-to-human transmission case in Hong Kong in 1997 (1, 2). Since this first emergence, Avian Influenza has been responsible for influenza outbreaks around the world in birds, mammals, and humans. The current avian influenza outbreak started in 2020, and as of October, 2023 is responsible for the deaths of 59.41M birds, including 6,467 wild birds, in 47 states and 401 counties (3-5).

Influenza is caused by four virus types: A, B, C, and D, and avian influenza is type A. Scientists further characterize type A influenza into subtypes based on two surface proteins, hemagglutinin (HA) and neuraminidase (NA). New combinations of HA and NA surface glycoproteins reflect new viruses with different properties. Currently there are 18 hemagglutinin subtypes and 11 neuraminidase subtypes, and birds are the reservoir host for 16 hemagglutinin and nine neuraminidase subtypes (6).

Within avian influenza type A subtype (H5), researchers have characterized nine subtypes, H5N1 through N5N9 (6). Of these (H5) subtype viruses, most are low pathogenic avian influenza (LPAI) viruses and do not manifest into severe clinical disease but can mutate into highly pathogenic avian influenza (HPAI) H5N1. HPAI H5N1 has been responsible for numerous outbreaks in poultry flocks and humans around the world. Further, at least nineteen countries have reported human infections of HPAI H5N1 since 2003 (6).

When HPAI H5N1 infects humans, the results can be devastating. Since 2003 over 50% of the human cases of HPAI H5N1 have been fatal(6). Influenza A is not limited to bird species. Influenza A can infect humans and animals including waterfowl (ducks and geese), bats, dogs, poultry, pigs, and horses (7). In the current outbreak, avian influenza type A, subtype H5N1 is the responsible strain, and it is responsible for transmission among wild and domestic birds, other animals, and humans (7).

In Florida, the Florida Fish and Wildlife Conservation Commission, or Florida Wildlife Commission (FWC), has jurisdiction for tracking avian influenza-affected birds in the state. Scientists with the FWC detected the first cases of the HPAI subtype H5N1 in Florida in January 2022. In March 2022, scientists from the University of Florida discovered a dead bottlenose dolphin at Horseshoe Bay in Dixie County, and this dolphin was positive for HPAI H5N1. Since these first HPAI detections, the FWC has documented HPAI in 37 counties (Figure 1.1) across the state in black vultures and waterfowl, including lesser scaup and Muscovy duck (8). Florida scientists have further isolated HPAI H5N1 in bald eagles, owls, other birds of prey, and different species of waterfowl (8).

Understanding the transmission of avian influenza is vital in helping to mitigate the risk that the virus poses to birds, mammals, and humans. The two primary methods of transmission for are 1) direct transmission from a bird infected with avian influenza virus and 2) indirect transmission of the virus via an intermediate host, often another animal (7). Birds infected with H5N1 shed the virus in their feces, via mucus, and in their saliva; and when other birds or animals are exposed to these infected secretions, they are at risk for infection (9).

The first human cases of HPAI H5N1 from Hong Kong are of “Asian-lineage,” and are responsible for the majority of human morbidity and mortality to date (2, 10). Birds are responsible for the spread of human cases via virus shedding, and transmission to humans occurs secondarily with virus exposure to eyes, nose, and mouth (mucosal contact or inhalation). Likelihood of transmission to humans increases with exposure time, and transmission can be direct transmission from birds or via contaminated fomites (9, 10). Human cases in the current outbreak of HPAI H5N1 are rare at this time, and sustained human-to-human transmission has not been identified (9, 10).

Due to their high susceptibility, poultry and non-waterfowl of Florida are the bird populations at the highest risk for HPAI H5N1 infection. Waterfowl are less susceptible to serious clinical disease when compared to non-waterfowl, and as of February 28, 2023, state scientists have identified 2,007 birds positive for HPAI H5N1, which is thought to represent a fraction of the actual HPAI H5N1 bird cases in Florida (8). Despite the Florida poultry industry having nearly 90 million commercial chickens (approximately 79 million broilers and 11 million layers), there have been no commercial flocks affected during the current outbreak (11, 12). The highest concentration of commercial poultry operations affected by HPAI are in the upper Midwest and the mid-Atlantic states (Figure 1.2), yet despite the lack of commercial poultry flocks in Florida affected, the risk for these poultry operations in Florida is high due to potential contact with infected wild birds.

In addition to birds and humans, scientists have isolated HPAI from various mammals (6). When these animals are infected with HPAI H5N1 viruses, there can be profound disease manifestations up to, and including, death. Select species to date, including cats and seals, are incidental hosts, but mammal-to-mammal disease transmission has not been documented (6). The risk of animals contracting avian influenza in this current outbreak has remained low, and there are no reports of sustained transmission of HPAI H5N1 between any species other than birds.

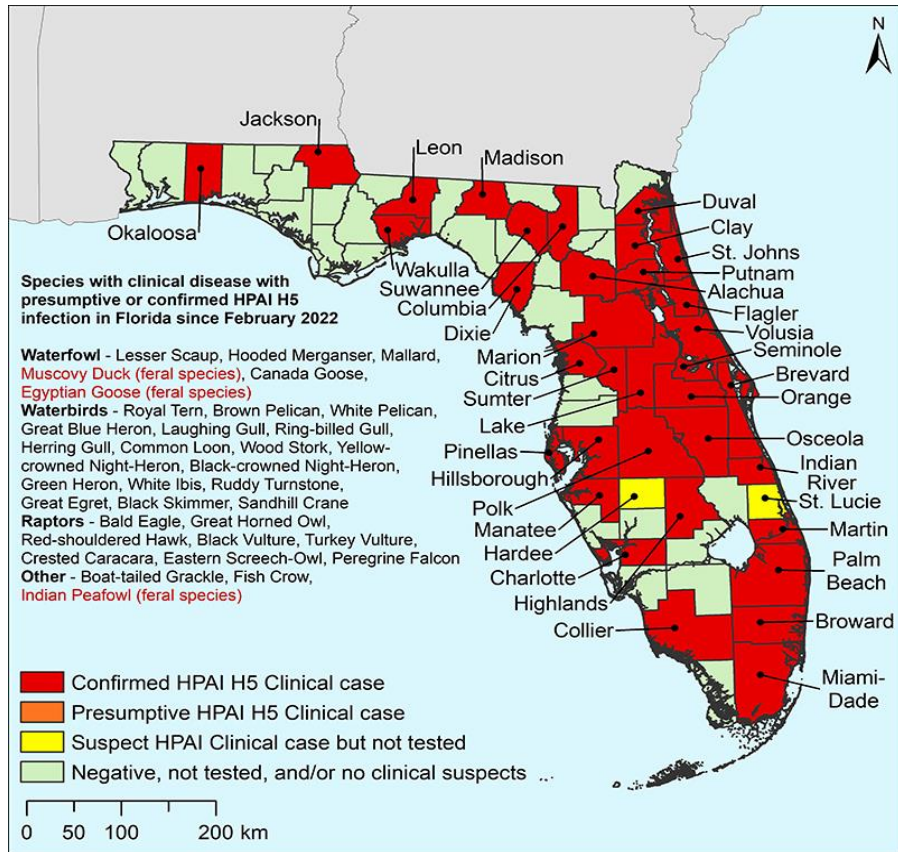


Figure 1.1 Distribution of HPAI cases in Florida Counties since January 2020 (17)

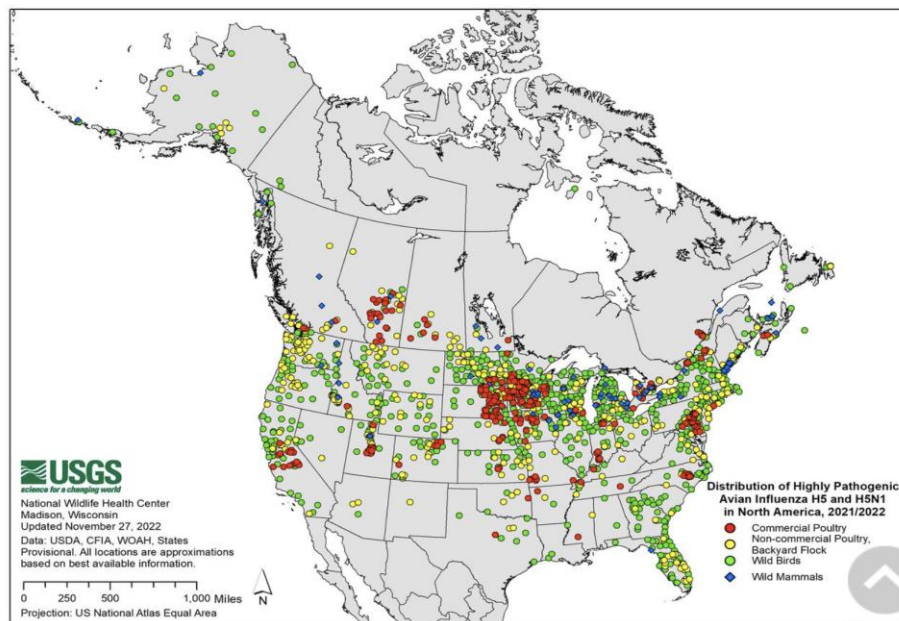


Figure 1.2 Distribution of Avian Influenza H5 and H5N1 in North America in 2021-2022 (13)

Human cases of HPAI H5N1 in the current outbreak have fortunately remained very low in relation to the numbers of birds affected. The first known human case of H5N1 in a human occurred in December 2021 in a human with known high exposure to domestic birds (14). The second known case of a human testing positive for HPAI H5N1 occurred in Colorado in a poultry worker (9). Two human cases is small when compared to the over 880 known cases of HPAI H5N1 that occurred around the world since 2003 with previous (Asian avian influenza) outbreaks (9). In addition to these two known positive cases, the Centers for Disease Control and Prevention followed over 2,500 exposures and suspected cases of HPAI H5N1 in United States and has found no other positive cases (9).

The Applied Practical Experience (APE), the on-site agency experience required for completion of the MPH, was formulated in conjunction with the FWC because of existing relationships between veterinarians in the U.S. Army Reserve and veterinarians at the FWC. The project was designed to address a One Health approach to animals and humans in the state of Florida. A population of individuals in Florida who is vulnerable to HPAI H5N1 are avian rehabilitators, who handle and manage sick birds across the state. Additionally, infected fowl that enter Florida put not only other wild birds at risk, but they also threaten poultry operations, humans, and many susceptible terrestrial and marine mammals. The designed project will bring updates to avian rehabilitators on management of suspected HPAI H5N1 cases and will also provide guidance to the FWC to help manage future infectious disease outbreaks.

Chapter 2 - Learning Objectives and Project Description

The overarching mission of the FWC is to “manage fish and wildlife resources for the long-term well-being and benefit of people,” and the scientists within the FWC Fish and Wildlife Research Institute monitor Florida’s animals and birds to help long-term sustainability. In late 2021, veterinarians with the FWC were monitoring reports of HPAI H5N1 moving south from Canada through Virginia, and into both South and North Carolina, and in January 2022 scientists with the FWC detected HPAI H5N1 in a blue-winged teal in Florida (8). The FWC immediately increased its efforts to understand the sense of the disease in Florida, the potentially impacted personnel, and animals, and what needed to be accomplished from an education standpoint to protect the public. In March 2022, the FWC identified a bottlenose dolphin with neurologic signs, and diagnostic tests confirmed that the dolphin was positive for HPAI, which could indicate a greater risk for marine mammals for Florida (8). The FWC maintains a comprehensive, and within the menus of the Wildlife Division is a section that is dedicated to birds, including a section dedicated to Avian Influenza (<https://myfwc.com/research/wildlife/health/avian/influenza/>).

The scientists and veterinarians at the FWC identified three groups of people who could potentially be at higher risk for exposure to HPAI H5N1: 1) hunters, 2) backyard poultry operators, which, according to the Florida Department of Agriculture and Consumer Services (FDACS) and the United States Department of Agriculture (USDA) Animal Plant Health Inspection Service (APHIS), maintain 1,000 or fewer birds, and 3) avian rehabilitators (19, 20). Because of the proximity of each of these groups to birds, each is susceptible to exposure to wild birds that might be infected with HPAI H5N1. Because of the needs and resources of the FWC, it was decided that a project to understand and educate the avian rehabilitation community would be the most beneficial for the FWC. Early in 2022, the FWC began efforts to educate these groups on avian influenza and how to reduce their risk of disease. Efforts to educate bird hunters and the backyard flock owners saw early success, likely due to previous awareness, regulatory requirements, and cross-educational efforts from the state for larger commercial poultry operations. Efforts to educate the avian rehabilitators were focused on online information via the FWC website on direct communications with avian rehabilitation associations. Avian rehabilitators also receive a diverse assortment of birds that are failing to thrive, and these birds could potentially be affected by HPAI H5N1. If the rehabilitation facilities take in sick birds, these birds could endanger other birds in rehabilitation, the resident birds, and the rehabilitators.

Assessment of the effects of the education efforts of this cohort was unknown, so conversations were started with the FWC in February 2022 to develop a public health project that could help the FWC characterize its efforts on educating avian rehabilitators and be applied to potential future infectious disease outbreaks.

The objectives of the project were:

- Understand the scope of knowledge of avian rehabilitators about HPAI H5N1
- Understand how avian rehabilitators were prepared for an HPAI H5N1 outbreak.
- Understand if the behavior of the avian rehabilitators changed during the outbreak.
- Understand any limitations that the avian rehabilitators had.
- Understand the birds that they were rehabilitating.
- Understand how they suspected potential cases of HPAI H5N1.
- Create updated FWC guidelines for avian rehabilitators.
- Create guidelines for the FWC for future infectious disease outbreaks in Florida.

To achieve these objectives, a plan was made to:

- Participate in sample collections events from affected birds with the FWC.
- Review the current educational materials available for avian rehabilitators from the FWC.
- Prepare and administer a survey tool designed for avian rehabilitators in Florida.
- Utilize the results of the survey to help update FWC educational materials for rehabilitators.
- Utilize the results of the survey to construct internal guidelines for FWC scientists to help educate avian rehabilitators on future general infectious disease outbreaks in Florida.

Site visits to the FWC in Gainesville, FL location were planned and conducted in May 2022 and April 2023. The purpose of the visits was to understand the efforts being undertaken by FWC officials to characterize HPAI H5N1 and to learn how to collect and process samples from affected birds for HPAI H5N1 (Figures 2.1-2.4). The avian rehabilitator survey (Appendix Portfolio A) questions were developed in April-May 2023 to capture knowledge and behavior before the outbreak and during the outbreak, with a plan to distribute the survey in June 2023. However, due to a sudden lack of HPAI H5N1 cases in Florida after May 2023, updated survey

questions were subsequently developed in July 2023. The updated survey was designed to capture knowledge and behavior before, during, and now after the outbreak. A Florida Freedom of Information Act request was made to acquire the names and email addresses of all rehabilitators in the state of Florida July 2023, duplicate email addresses were eliminated, and the survey was sent to all rehabilitators in August 2023. The comprehensive wildlife rehabilitator list contained all facilities and individuals registered with the state from January 2021 through July 2023. The survey was developed and administered using Google Forms, and a follow-up survey reminder was sent to all email addresses in September 2023.



Figure 2.1 Black vulture die-off site near White Springs, Florida (May 2022)



Figure 2.2 Dead black vulture near White Springs, Florida (May 2022)



Figure 2.3 Collecting dead black vulture for processing (May 2022)



Figure 2.4 Collecting specimens for processing with FWC (May 2022)

The original list of rehabilitation facilities contained 797 facilities, but only contained 581 unique email addresses. Most of the rehabilitation facilities in Florida do not see birds, but the Freedom of Information Act request could not be limited to avian rehabilitators. The U.S. Fish and Wildlife Service, however, also maintains a list of federally registered migratory bird rehabilitation facilities, and in August 2023, there were 33 listed in Florida (Figure 2.5).

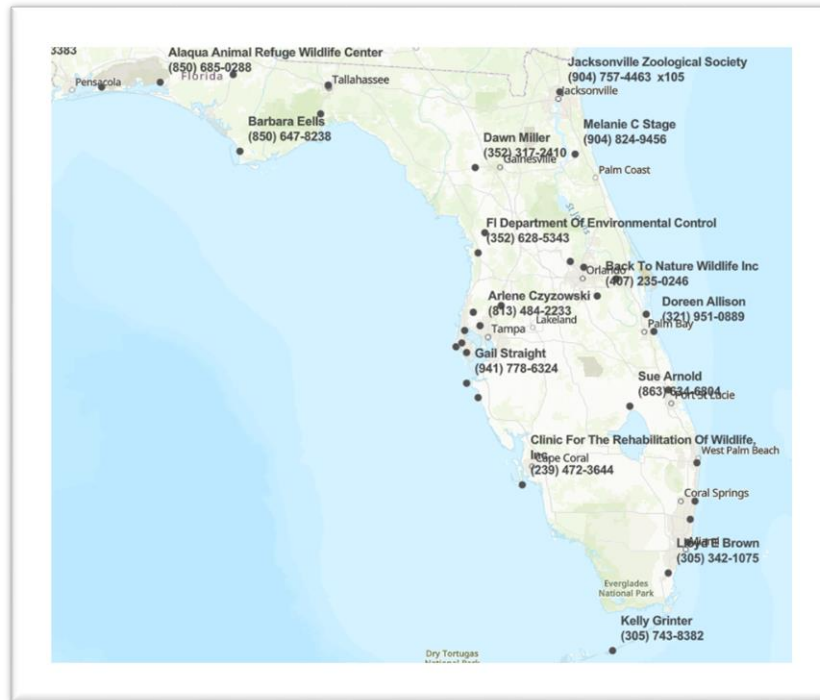


Figure 2.5 Locations of Registered Migratory Bird Rehabilitation Facilities in Florida (18)

To reach the broadest possible audience of avian rehabilitators, the survey was sent to all the 581 unique email addresses with a goal of at least 50% response. After two rounds of the survey, there were 20 out of 33 respondents (60.6%) who self-identified as avian rehabilitators who completed the survey in full. Respondents were asked to only complete one survey per rehabilitation facility.

Chapter 3 - Results & Discussion

To help reduce the risk of spread of H5N1, public health partners at local, state, and national levels must work together. At the federal level, the USDA APHIS leads the effort in conjunction with the Department of Interior and the US Fish and Wildlife Service, and in Florida, the FWC is the lead organization. To help the FWC better understand the extent of the disease impact in the avian rehabilitation community, this project was designed to gather information to better help them get the information they needed via the channels of information that they use to communicate.

The survey was closed on September 15, 2023, and the results were analyzed to help determine both the knowledge, attitudes, and practices of avian rehabilitators to the most recent HPAI H5N1 outbreak and to help guide recommendations for the FWC on any future infectious disease outbreak.

Key Qualitative Themes of the Survey:

- There is a wide range of understanding about infectious disease and responses to outbreaks among avian rehabilitators who responded,
- With HPAI H5N1, euthanasia was key to controlling the spread of disease.
- Personal Protective Equipment (PPE) use among respondents before the event, during the event, and after the event was unchanged except in the use of disposable gloves and surgical masks, which both increased in usage.
- Avian rehabilitators wish to receive broader training on infectious diseases.
- Avian rehabilitators felt that they had limited resources with which to respond to the outbreak of HPAI H5N1

The key themes of the survey were used to update the FWC “Recommendations to Reduce the Risk of Highly Pathogenic Avian Influenza HPAI H5N1 Transmission in Wildlife Rehabilitation Centers” document (Appendix Portfolio B). The specific findings from the current outbreak of HPAI H5N1 were collected and used to help craft guideline recommendations for use by the FWC internally (Appendix Portfolio C) for potential future infectious disease outbreaks in Florida.

Key HPAI H5N1 findings:

- 85% of respondents continued to receive birds after the HPAI H5N1 outbreak was identified
- 50% of respondents reported encountering rehabilitated birds with suspected HPAI H5N1
- 20% of respondents reported taking no measures to reduce the spread of HPAI H5N1
- 75% of respondents relied solely on clinical signs for diagnosis of HPAI H5N1
- Despite HPAI being a reportable disease and by law must be reported to the Florida Department of Agriculture and Consumer Services, only 65% of respondents reported having a protocol in place to report the disease.
- 85% of respondents reported monitoring government/health agency sites to get updates on HPAI.
- The most common steps identified by respondents to prepare for future HPAI outbreaks are:
 - Training staff on HPAI (85%)
 - Acquire the necessary PPE (75%)
 - Establishing partnerships with avian health professionals or local authorities (75%)
- 55% of respondents reported implementing strict quarantine for all new arrivals.
- No (0%) respondents indicated any bird-to-bird transmission of HPAI H5N1
- Diagnostic testing of birds remained low during the active outbreak with only 60% of respondents submitting the samples for definitive state diagnostic tests.
- 30% of respondents “strongly agreed” that personnel received training or education on HPAI.

Highly pathogenic avian influenza is a disease of economic and public health concern locally, nationally, and globally. Birds, animals, and humans are susceptible to the virus, and if the virus propagates it can have devastating consequences, and humans and animals in Florida are at risk. The Florida Commission of Wildlife recommends taking specific steps to help reduce the spread of disease, economic damage, and loss of life. Based on the survey conducted in the summer of 2023, FWC scientists recommend taking some specific measures to mitigate the risk of disease in and between birds, animals, and humans to include the following:

Recommendations for future infectious disease outbreaks:

- Resource allocation is key. Only 10% of respondents indicated that they had sufficient resources to manage a biosafety program.
- Birds that are used by facilities for educational purposes, “educational birds,” are a big part of the rehabilitator program (70% maintain resident birds)
 - Staff training on biosafety is vital, as 40% of respondents do not have dedicated staff to handle potentially sick birds separately from dedicated educational birds.
 - Recipients of education programs should also be educated on the risks associated with management of infectious disease outbreaks in bird populations.
- 1 in 5 facilities keep poultry on their premises, therefore education on biosafety, PPE use, and disease containment training is critical.
- Many facilities rely on clinical signs for diagnosis. Training on the need for proper diagnostic testing is important to understand the scope of disease.
- Euthanasia of affected birds remains an important way to reduce the spread of disease and human exposure to infectious disease agents.
- The most requested method to receive information on disease outbreaks is from regional or national avian rehabilitator associations, followed by online updates from government organizations such as US Department of Agriculture and the Centers for Disease Control and Prevention.

Limitations of the study include an a limited number of avian rehabilitation facilities in Florida, resulting in a low number of targets (N=33), and a low number of responses (N=20) to the survey which could lead to false assumptions about attitudes and behaviors, inability for the respondents to correctly identify suspect HPAI H5N1 birds, failure to correctly collect and submit samples for diagnostic testing, and that the respondents of the survey could have response bias due to their express interest in the topic. Rehabilitators could also be providing false responses to garner additional resources from the State. Additional studies are needed to build a more complete picture of the management of HPAI H5N1 cases more accurately by avian rehabilitators.

In conclusion, the recommended mitigation measures are designed to be easily implemented, and communication is vital across rehabilitators the state. Florida has been

successful preventing large epizootics of HPAI H5N1 infections in the state, and to date there have been no HPAI H5N1 deaths in any of the commercial poultry operations. Influenza is a virus that can rapidly evolve via antigenic drift and antigenic shift, and even though the current HPAI H5N1 variant does not affect humans in large numbers, it is potentially just one mutation away from a potential pandemic.

Chapter 4 - Competencies

Table 4.1 Summaries of MPH Competencies

Number and Competency		Description
4	Interpret results of data analysis for public health research, policy, or practice	Development, distribution, and evaluation of survey tool to characterize preparedness of avian rehabilitators in Florida to help update the Florida Wildlife Commission education practices.
13	Propose strategies to identify stakeholders and build coalitions and partnerships for influencing public health outcomes	Working with the FWC was able to utilize the Freedom of Information Act to comprehensive and up-to-date lists of registered rehabilitators in Florida. Cross-referenced this list with the list curated by Dr. Cunningham and active avian rehabbers to target the most likely impacted group for exposure to potential zoonotic wildlife disease.
16	Apply principles of leadership, governance, and management, which include creating a vision, empowering others, fostering collaboration, and guiding decision making	Led the creation of a vision for improved management of information distribution in collaboration with the FWC for Florida avian rehabilitators. Aligned capabilities of the FWC with the preferred methods of communication of the rehab group to create novel guidelines for communications.
19	Communicate audience-appropriate public health content, both in writing and through oral presentation	Developed written guidelines for the FWC to improve communications on management of zoonotic infectious diseases for avian rehabilitators, and prepared presentation for virtual information sharing to the leading avian rehabilitation constituency in Florida.
21	Interprofessional and/or Intersectional Practice - Integrate perspectives from other sectors and/or professionals to promote and advance population health.	Worked with FWC professionals and veterinarians, members of the USDA, veterinary pathologists from the Disney Animal Kingdom, and soldiers of the US Army Reserve (USAR) to train on, and collect samples from, affected birds in north central Florida.

Competency 4: Interpret results of data analysis for public health research, policy, or practice.

A quantitative and qualitative survey tool was developed in coordination with mentor, Dr. Mark Cunningham, FWC, to help understand how the HPAI H5N1 outbreak impacted avian rehabilitators across Florida. While there are approximately 585 individuals registered with the state as animal rehabilitators, there is a much smaller number of organizations that specialize in the rehabilitation of birds. The goals of the survey were to better understand individuals' knowledge of HPAI H5N1, how their facilities were prepared before the outbreak, how they responded to the outbreak, to what level they were impacted, how they received information about the disease during the outbreak, and how they wanted to receive their education in the future. While the overall response rate was 3.3% due to the large number of non-avian rehabilitators who were included in the distribution list, the response rate for avian-specific rehabilitation operations was 60.6%. Based on the survey results following the mailing and two reminders to achieve an appropriate response rate, guidelines were crafted to help guide FWC policy for the future communications with the avian-specific rehabilitation community to optimize information transfer the appropriate individuals as quickly and efficiently as possible.

Competency 13: Propose strategies to identify stakeholders and build coalitions and partnerships for influencing public health outcomes.

The public health outcomes of interest are to reduce the potential risk of human exposure of HPAI, to minimize the spread of disease between birds and from birds to humans, and to optimize the education of potential populations of exposed individuals. To achieve the goals, affected stakeholders were identified in collaboration with the FWC. USDA, a key partner, measures and maintains rates of HPAI H5N1 cases in wild and domestic birds and was consulted during necropsy training sessions. A Freedom of Information Act request for rehabilitators was made, and this list was cross-referenced with avian specific rehabbers provided by Dr. Cunningham. Preventive medicine veterinarians of the US Army Reserve were also consulted and utilized for collection and sampling of some populations of wild birds in collaboration with the FWC.

Competency 16: Apply principles of leadership, governance, and management, which include creating a vision, empowering others, fostering collaboration, and guiding decision making.

Principles of leadership, governance, and management were applied to coordinate conversations and goals among the FWC, the requirements of the MPH project, and the capabilities and limitations of the avian rehabilitation individuals. Careful management of

communication and expectation setting were done in preparation of the project, face-to-face meetings on two separate residencies with the FWC, and via electronic communications in support of the development, implementation, and interpretation of the survey results to craft guidelines for improved communication of avian rehabilitators.

Competency 19: Communicate audience-appropriate public health content, both in writing and through oral presentation

The end-user audiences of the developed communications are both the FWC and the Florida avian rehabilitators. The written FWC guidelines are produced in alignment with FWC standards and intended for use by internal FWC staff to help guide future education and training updates with the avian rehabilitators. A presentation of the lessons learned and future actions to optimize training and education was required for the rehabilitation community as this cohort has different capabilities, education, and needs.

Competency 21: Interprofessional and/or Intersectional Practice - Integrate perspectives from other sectors and/or professionals to promote and advance population health.

Led and coordinated efforts of this project as a member of Kansas State University with members of the U.S. Army Reserve and the Florida Wildlife Commission. Addition training on Avian Influenza was delivered by the USDA, the University of Florida College of Veterinary Medicine, the Florida Extension Service, and the Animal Kingdom at Disney.

The following MPH completed coursework fulfilled the competencies listed in Table 5.2.

Table 4.2 MPH Foundational Competencies and Course Taught In

22 Public Health Foundational Competencies Course Mapping	MP H 701	MPH 720	MP H 754	MP H 802	MP H 818
Evidence-based Approaches to Public Health					
1. Apply epidemiological methods to the breadth of settings and situations in public health practice	x		x		
2. Select quantitative and qualitative data collection methods appropriate for a given public health context	x	x	x		
3. Analyze quantitative and qualitative data using biostatistics, informatics, computer-based programming, and software, as appropriate	x	x	x		
4. Interpret results of data analysis for public health research, policy, or practice	x		x		

Public Health and Health Care Systems					
5. Compare the organization, structure and function of health care, public health, and regulatory systems across national and international settings		x			
6. Discuss how structural bias, social inequities and racism undermine health and create challenges to achieving health equity at organizational, community and societal levels					x
Planning and Management to Promote Health					
7. Assess population needs, assets and capacities that affect communities' health		x		x	
8. Apply awareness of cultural values and practices to the design or implementation of public health policies or programs					x
9. Design a population-based policy, program, project, or intervention			x		
10. Explain basic principles and tools of budget and resource management		x	x		
11. Select methods to evaluate public health programs	x	x	x		
Policy in Public Health					
12. Discuss multiple dimensions of the policy-making process, including the roles of ethics and evidence		x	x	x	
13. Propose strategies to identify stakeholders and build coalitions and partnerships for influencing public health outcomes		x		x	x
14. Advocate for political, social, or economic policies and programs that will improve health in diverse populations		x			x
15. Evaluate policies for their impact on public health and health equity		x		x	
Leadership					
16. Apply principles of leadership, governance, and management, which include creating a vision, empowering others, fostering collaboration and guiding decision making		x			x
17. Apply negotiation and mediation skills to address organizational or community challenges		x			
Communication					
18. Select communication strategies for different audiences and sectors	DMP 815, FNDH 880 or KIN 796				
19. Communicate audience-appropriate public health content, both in writing and through oral presentation	DMP 815, FNDH 880 or KIN 796				
20. Describe the importance of cultural competence in communicating public health content		x			x
Interprofessional Practice					
21. Interprofessional and/or Intersectional Practice - Integrate perspectives from other sectors and/or professionals to promote and advance population health.		x			x
Systems Thinking					

22. Apply systems thinking tools to a public health issue			x	x	
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Student Attainment of MPH Foundational Competencies

Table 5.3 Summary of MPH Emphasis Area Competencies

MPH Emphasis Area: Infectious Diseases & Zoonoses		
Number and Competency		Description
1	Pathogens/pathogenic mechanisms	Evaluated Avian Influenza HPAI H5N1 and transmission between birds, to mammals, and to humans.
2	Host response to pathogens/immunology	Described species immune response regarding species-dependency, waterfowl prevalence, domestic bird susceptibility, and transmission from birds to humans and mammals to humans.
3	Environmental/ecological influences	Examined the influence of migratory flyways, proximity to water sources, proximity to other avians species, avian-human interface; discussed potential seasonality and maintenance in the waterfowl populations.
4	Disease surveillance	Analyzed HPAI H5N1 surveillance efforts in the US by different federal and state agencies, what the FWC is doing, and identified potential gaps in surveillance that can be improved.
5	Disease vectors	Avian Influenza, while not a vector-borne disease, is maintained in the bird-specific populations of waterfowl, while then infecting other birds, mammals, and humans.

Competency 1 - Pathogens/pathogenic mechanisms

The focus of this Applied Practical Experience was on the infectious disease, avian influenza in Florida, its epidemiology and spread in birds, mammals, and humans. Attained the foundations for this competency through my university courses on veterinary bacteriology, microbiology, and virology, and the general concepts were then applied to the real-world outbreak of HPAI H5N1 in Florida that occurred between January 2022 and May 2023.

Participated in the active collection and processing of samples from birds suspected to be infected with HPAI H5N1 and two different residencies with the FWC.

Competency 2 - Host response to pathogens/immunology

Established foundation for veterinary immunology through The Principles of Veterinary Immunology course at Kansas State University, and then worked with the FWC veterinarians on the variable effects of HPAI H5N1 on different species of birds. Conversations with USDA veterinarians on the features and benefits of vaccination of birds provided additional insight into the immune response of birds to the disease and to potential vaccines. Further conversations provided additional background and training on how HPAI spreads amongst birds, to mammals, and potentially to humans. The antigenic drift and shift of the virus could potentially lead to a virus able to circumvent the human immune system and lead to a devastating outbreak of human avian influenza.

Competency 3 - Environmental/ecological influences

The competency for environmental and ecological influences was founded in the One Health and Environmental Health courses, and the course application was realized during the Geographic Information Systems (GIS) course. HPAI H5N1 is an archetypal One Health disease concept of overlapping spheres of influence between humans, animals, and the environment. Migration patterns of waterfowl, prevailing winds, flight ways, water access, and potential encounters of humans, wild birds, and poultry define the study of HPAI H5N1 and how the environment influences the positive, or negative, spread of the disease. The ideal end-state of the study of the disease in its environment is to be able to predict when, where, and how the disease will next manifest, and this knowledge can then be used to place interdiction efforts to reduce the risk of disease for birds, animals, and humans.

Competency 4 - Disease surveillance

The basis for the disease surveillance competency was gained through my university courses in veterinary epidemiology, environmental health, One Health, biostatistics, and zoonotic/preventive medicine. The HPAI H5N1 outbreak in Florida in 2022-2023 was an ideal model to study disease surveillance and spread. While my interests were primarily with wild birds, it was also important to track and compare cases of HPAI H5N1 across the United States that were associated with domestic poultry operations, mammal confirmations, and human

exposures and cases. One difficulty lies in making accurate estimates of the disease in wild population because of the lack of confirmatory diagnostic testing on affected animals. By also monitoring surveillance efforts of the USDA and other federal and state organizations with commercial poultry operations, wild birds, and captive wild birds, the state of Florida can prepare for potential cases of HPAI H5N1 in the state.

Competency 5 - Disease vectors

The HPAI H5N1 epizootics currently affecting the United States provide an excellent instance for the study of disease vectors for the influenza virus. The coursework classes that provided the foundation for this competency are veterinary bacteriology, veterinary virology, veterinary epidemiology, environmental health, One Health, and zoonotic/preventive medicine. The avian vector behavior modeling of wild birds, domestic flocks, mammal interactions, and human behavior help to characterize the ability for HPAI H5N1 to establish itself in the environment. While spikes in cases result in identification of geographic foci, the subclinical manifestation of the disease in waterfowl seems to help the virus maintain a minimal foothold across the continental United States, and likely much further. The ability for the virus to replicate in different species allows it to survive in diverse populations and environments provides it with a certain degree of resistance to complete eradication.

References

1. “Past Examples of Probable Limited, Non-Sustained, Person-to-Person Spread of Avian Influenza A Viruses” (Centers for Disease Control and Prevention, 2023); <https://www.cdc.gov/flu/avianflu/h5n1-human-infections.htm>.
2. C. Buxton Bridges, J. M. Katz, W. H. Seto, P. K. Chan, D. Tsang, W. Ho, K. H. Mak, W. Lim, J. S. Tam, M. Clarke, S. G. Williams, A. W. Mounts, J. S. Bresee, L. A. Conn, T. Rowe, J. Hu-Primmer, R. A. Abernathy, X. Lu, N. J. Cox, K. Fukuda, Risk of influenza A (H5N1) infection among health care workers exposed to patients with influenza A (H5N1), Hong Kong. *J Infect Dis* **181**, 344-348 (2000).
3. “H5N1 Bird Flu Detections across the United States (Backyard and Commercial)” (Centers for Disease Control and Prevention, 2023); <https://www.cdc.gov/flu/avianflu/data-map-commercial.html>.
4. “H5N1 Bird Flu Detections across the United States (Wild Birds)” (Centers for Disease Control and Prevention, 2023); <https://www.cdc.gov/flu/avianflu/data-map-wild-birds.html>.
5. “H5N1 Bird Flu: Current Situation Summary” (Centers for Disease Control and Prevention, 2023); <https://www.cdc.gov/flu/avianflu/avian-flu-summary.htm>.
6. “Influenza Type A Viruses” (Centers for Disease Control and Prevention, 2022); <https://www.cdc.gov/flu/avianflu/influenza-a-virus-subtypes.htm>.
7. “Transmission of Avian Influenza A Viruses Between Animals and People” (Centers for Disease Control and Prevention, 2023); <https://www.cdc.gov/flu/avianflu/virus-transmission.htm>.
8. “FWC continues to monitor avian influenza across Florida” (Florida Fish and Wildlife Commission, 2023); <https://myfwc.com/news/all-news/hpai-223/#:~:text=The%20Florida%20Fish%20and%20Wildlife,in%20Florida%20in%20January%202022>.
9. “U.S. Case of Human Avian Influenza A(H5) Virus Reported” (Centers for Disease Control and Prevention, 2022); <https://www.cdc.gov/media/releases/2022/s0428-avian-flu.html>.
10. “Bird Flu Virus Infections in Humans” (Centers for Disease Control and Prevention, 2022); <https://www.cdc.gov/flu/avianflu/avian-in-humans.htm>.

11. "2022-2023 Detections of Highly Pathogenic Avian Influenza" (United States Department of Agriculture, 2023); <https://www.aphis.usda.gov/aphis/ourfocus/animalhealth/animal-disease-information/avian/avian-influenza/2022-hpai>.
12. "Poultry" (University of Florida. IFAS Extension., 2018); <https://sfyl.ifas.ufl.edu/agriculture/poultry/>.
13. N. W. H. Center, "Distribution of Highly Pathogenic Avian Influenza in North America, 2021/2022" (US Geologic Survey, 2022); <https://www.usgs.gov/centers/nwhc/science/distribution-highly-pathogenic-avian-influenza-north-america-20212022>.
14. I. Oliver, J. Roberts, C. S. Brown, A. M. Byrne, D. Mellon, R. Hansen, A. C. Banyard, J. James, M. Donati, R. Porter, J. Ellis, J. Cogdale, A. Lackenby, M. Chand, G. Dabrera, I. H. Brown, M. Zambon, A case of avian influenza H5N1 in England, January 2022. *Euro Surveill* **27**, (2022).
15. E. Niqueux, M. Flodrops, C. Allee, M. O. Lebras, I. Pierre, K. Louboutin, C. Guillemoto, A. Le Prioux, S. Le Bouquin-Leneveu, A. Keita, M. Amelot, C. Martenot, P. Massin, M. Cherbonnel-Pansart, F. X. Briand, A. Schmitz, C. Cazaban, G. Dauphin, T. Delquigny, S. Lemiere, J. M. Watier, M. Mogler, I. Tarpey, B. Grasland, N. Eterradosi, Evaluation of three hemagglutinin-based vaccines for the experimental control of a panzootic clade 2.3.4.4b A(H5N8) high pathogenicity avian influenza virus in mule ducks. *Vaccine* **41**, 145-158 (2023).
16. E. Mahase, H5N1: Has there been human-to-human transmission, and do we have a vaccine? *BMJ* **380**, p510 (2023).
17. Florida Fish and Wildlife Conservation Commission, " Highly Pathogenic Avian Influenza in Florida by County – updated 1/23/2023" (FWC, 10/2023); <https://myfwc.com/research/wildlife/health/avian/influenza/>
18. US Fish and Wildlife Service, "Find a Migratory Bird Rehab Facility" (US Fish and Wildlife Service, 2023); <https://fws.maps.arcgis.com/apps/instant/nearby/index.html?appid=6e5a1e28771543f5ba195f85ffb95b17>.
19. US Department of Agriculture, Animal Plant Health Inspection Service, "Poultry '04 Part I: Reference of Health and Management of Backyard/Small Production Flocks in the UnitedStates, 2004" (USDA, 2005); https://www.aphis.usda.gov/animal_health/nahms/poultry/downloads/poultry04/Poultry04_dr_PartI.pdf

20. Florida Department of Agriculture and Consumer Services, "Limited Poultry and Egg Operation Requirements (FDACS, March 2022);
https://ccmedia.fdacs.gov/content/download/64357/file/Limited_Poultry_and_Egg_Operation_Requirements.pdf

Appendix

The appendix contains the following portfolio products:

- Portfolio A: Survey Tool Developed for Florida Rehabilitators
- Portfolio B: Updated Guidelines for Florida Rehabilitators on HPAI H5N1
- Portfolio C: Internal FWC Guidelines for Future Infectious Disease Outbreaks

Florida Bird Rehabber Survey (Summer 2023)

Dear Florida Bird Rehabilitators,

We hope this message finds you well. As you may recall, in January 2022, Highly Pathogenic Avian Influenza (HPAI) H5N1 was first identified in Florida, raising concerns about the impact of this disease on wild bird populations and the need for effective management strategies. As dedicated professionals in the field of bird rehabilitation, your role in mitigating the spread of avian influenza and ensuring the welfare of birds is crucial.

To this end, we are conducting a survey of rehabilitation facilities across the state of Florida to assess the knowledge, experiences, and strategies employed by bird rehabbers before, during, and after the identification of HPAI H5N1. By participating in this survey, you will contribute to a comprehensive understanding of the impact of avian influenza and help us identify areas where support, guidance, and resources may be needed.

Your participation in this survey is greatly appreciated and completely voluntary. The survey consists of a series of multiple-choice questions, scaled responses, and some short answer questions that cover various aspects of avian influenza management in bird rehabilitation centers.

The goal of asking for your participating in this study is to help provide support, guidance, and resources to rehabilitation facilities and people in the event of future highly pathogenic avian influenza outbreaks or other potential outbreaks of infectious diseases that can have an impact on human, bird, and animal health.

NOTE: In some instances, there were multiple email address for a single facility. Please provide only one response per rehabilitation facility. If your email is associated with multiple facilities/organizations, you might be asked to provide a response for each facility/organization.

Due Date: In order for us to be able to analyze the responses, we kindly ask that you complete the survey as soon as possible.

Thank you so much for your time, your dedication to the well-being of birds, and your commitment to avian health.

Sincerely,

Zach Mills, DVM, MBA, GCPH, Kansas State University Public Health Program

Mark Cunningham, DVM, MS, DACVPM, Florida Commission of Wildlife

* Indicates required question

1. Email *

2. 1. I have an in-depth understanding on Highly Pathogenic Avian Influenza (HPAI) H5N1 and its impact on wild bird populations. *

Mark only one oval.

1 2 3 4 5

Corr ☐ ☐ ☐ ☐ ☐ Completely Agree

3. 2. Have you treated any birds that were infected with Highly Pathogenic Avian Influenza (HPAI) H5N1? *

Mark only one oval.

- ☐ Yes, I have treated birds with Highly Pathogenic Avian Influenza (HPAI) H5N1.
- ☐ No, I have not treated birds with Highly Pathogenic Avian Influenza (HPAI) H5N1.
- ☐ I am not sure.
- ☐ N/A - I am not involved in bird treatment or rehabilitation.
- ☐ Other: _____

4. 3. Our facility has taken safety measures to prevent the spread of avian influenza in our rehab center. *

Mark only one oval.

1 2 3 4 5

Stro ☐ ☐ ☐ ☐ ☐ Strongly agree

5. **4. If your facility has taken safety measures to prevent the spread of Highly Pathogenic Avian Influenza (HPAI) H5N1, what measures have you taken? Please list all that apply.**

6. **5. Our facility has taken steps to determine if a bird has an infection with Highly Pathogenic Avian Influenza (HPAI) H5N1.** *

Mark only one oval.

1 2 3 4 5

Strongly ☐ ☐ ☐ ☐ ☐ Strongly agree

7. **6. What steps, if any, have your facility taken to determine if a bird has Highly Pathogenic Avian Influenza (HPAI) H5N1? Please list all that apply.** *

8. **7. Which of the following additional steps, if any, does your facility currently utilize to determine whether a bird has Highly Pathogenic Avian Influenza (HPAI) H5N1 infection?** *

Check all that apply.

- ☐ Conducting diagnostic tests for avian influenza.
☐ Observing clinical signs.
☐ Consulting with veterinary experts or avian health professionals.
☐ Combination of diagnostic tests and clinical observations.
☐ None
☐ Other: _____

9. **8. Our facility currently offers treatment options for birds with Highly Pathogenic Avian Influenza (HPAI) H5N1 infection** *

Mark only one oval.

1 2 3 4 5

Strongly ☐ ☐ ☐ ☐ ☐ Strongly agree

10. **9. If you offer treatment, what treatments do you currently offer for birds with Highly Pathogenic Avian Influenza (HPAI) H5N1 infection? Please list all that apply.**

11. **10. Which of the additional following treatment options, if any, does your facility currently offer for birds with Highly Pathogenic Avian Influenza (HPAI) H5N1 infection?** *

Check all that apply.

☐ Supportive care and monitoring for complications.

☐ Administration of antiviral medication.

☐ Isolation and strict quarantine measures.

☐ Euthanasia to prevent further spread.

☐ None

☐ Other: _____

12. **11. Do you currently have a protocol for reporting cases of Highly Pathogenic Avian Influenza (HPAI) H5N1 infection to local authorities?** *

Mark only one oval.

☐ Yes, we have a formal reporting protocol in place.

☐ No, we do not have a specific protocol for reporting cases of avian influenza.

☐ Not applicable - I am not involved in reporting cases to local authorities.

13. **12. Our facility actively stays up-to-date on the latest information and research about Highly Pathogenic Avian Influenza (HPAI) H5N1** *

Mark only one oval.

1 2 3 4 5

Strongly ☐ ☐ ☐ ☐ ☐ Strongly agree

14. **13. What do you currently do to stay updated on the latest information and research about Highly Pathogenic Avian Influenza (HPAI) H5N1 infection? Please list all methods that you utilize.**

15. **14. Which of the following additional methods, if any, do you currently use to stay updated on the latest information and research about Highly Pathogenic Avian Influenza (HPAI) H5N1?** *

Check all that apply.

- ☐ Regularly attending conferences or workshops.
☐ Subscribing to scientific journals or publications.
☐ Collaborating with avian health professionals or veterinary experts.
☐ Monitoring government or health agency updates on avian influenza.
☐ None
☐ Other: _____

16. **15. Our facility provides recommendations to the public on how to help prevent the spread of Highly Pathogenic Avian Influenza (HPAI) H5N1 in wild bird populations.** *

Mark only one oval.

1 2 3 4 5

Corr ☐ ☐ ☐ ☐ ☐ Completely agree

17. **16. What recommendations do you make to the public on how to help prevent the spread of Highly Pathogenic Avian Influenza (HPAI) H5N1 in wild bird populations?**

18. **17. Which additional steps, if any, can bird rehabbers take to prepare for potential outbreaks of Highly Pathogenic Avian Influenza (HPAI) H5N1 in the future?** *

Check all that apply.

- ☐ Developing and updating an emergency response plan.
☐ Acquiring necessary personal protective equipment (PPE) and disinfection supplies.
☐ Training staff on avian influenza prevention, detection, and response.
☐ Establishing partnerships with avian health professionals or local authorities.
☐ Other: _____

19. **18. Have you encountered any cases of Highly Pathogenic Avian Influenza (HPAI) H5N1 in the birds you've rehabbed?** *

Mark only one oval.

- ☐ Yes, I have encountered cases of avian influenza in the birds I've rehabbed.
☐ No, I have not encountered any cases of avian influenza in the birds I've rehabbed.
☐ Not applicable - I am not involved in bird rehabilitation.

20. **19. If you encountered any cases of Highly Pathogenic Avian Influenza (HPAI) H5N1 in the birds you've rehabbed, what measures did you take to reduce or prevent the spread of Highly Pathogenic Avian Influenza (HPAI) H5N1? Please list all that apply.**

21. **20. What steps did you take to prevent the spread of Highly Pathogenic Avian Influenza (HPAI) H5N1 among the birds in your care?** *

Check all that apply.

- ☐ Implement strict quarantine measures for new arrivals.
- ☐ Maintain separate housing and isolation areas for sick birds.
- ☐ Regularly clean and disinfect cages, equipment, and facilities.
- ☐ Practice good hygiene and use personal protective equipment (PPE).
- ☐ None
- ☐ Other:

22. **21. The personnel in our facility have received training or education on Highly Pathogenic Avian Influenza (HPAI) H5N1.** *

Mark only one oval.

1 2 3 4 5

Stro ☐ ☐ ☐ ☐ ☐ Strongly agree

23. **22. What kind of training or education have you received regarding Highly Pathogenic Avian Influenza (HPAI) H5N1?** *

Check all that apply.

- ☐ Attended workshops or seminars specifically focused on avian influenza.
- ☐ Received training from avian health professionals or veterinary experts.
- ☐ Read scientific articles or publications about avian influenza.
- ☐ Completed online courses or webinars related to avian influenza.
- ☐ None
- ☐ Other: _____

24. **23. Have you ever had to work with government agencies or public health officials in response to a suspected or confirmed case of Highly Pathogenic Avian Influenza (HPAI) H5N1?** *

Mark only one oval.

- ☐ Yes, I have worked with government agencies or public health officials.
- ☐ No, I have not had to work with government agencies or public health officials.
- ☐ Not applicable - I have not encountered avian influenza cases.

25. **24. What advice would you give to bird owners or other rehabbers to help prevent the spread of Highly Pathogenic Avian Influenza (HPAI) H5N1?** *

Check all that apply.

- ☐ Practice strict biosecurity measures, including quarantine and disinfection.
- ☐ Report sick or dead birds to the appropriate authorities.
- ☐ Follow guidelines and recommendations from avian health professionals.
- ☐ Minimize contact with wild birds and maintain good hygiene practices.
- ☐ Other: _____

26. **25. What are the specific challenges or concerns that you have when it comes to managing Highly Pathogenic Avian Influenza (HPAI) H5N1 in a rehab setting?** *

Check all that apply.

- ☐ Availability of necessary resources and equipment.
- ☐ Balancing the need for rehabilitation with the risk of disease transmission.
- ☐ Financial constraints in implementing preventive measures.
- ☐ Lack of standardized protocols for avian influenza management.
- ☐ Other: _____

27. **26. What role do you believe bird rehabbers can play in helping to prevent or respond to Highly Pathogenic Avian Influenza (HPAI) H5N1 outbreaks?** *

Check all that apply.

- ☐ Providing care and treatment to affected birds.
- ☐ Implementing strict biosecurity measures to prevent disease spread.
- ☐ Participating in surveillance and reporting efforts.
- ☐ Educating the public about avian influenza prevention.
- ☐ Other: _____

28. **27. Please indicate the type of wildlife rehabilitation center you operate or are associated with:** *

Check all that apply.

- ☐ Avian-focused center
- ☐ Mammal-focused center
- ☐ Reptile-focused center
- ☐ Non-focused center

29. **28. Prior to January 2022, were you aware of the risks and potential impacts of Highly Pathogenic Avian Influenza (HPAI) H5N1 on wildlife rehabilitation centers?** *

Mark only one oval.

- ☐ Yes, I was well-informed
- ☐ I had some knowledge, but not in-depth
- ☐ No, I had little to no awareness

30. **29. Did your wildlife rehabilitation center implement any preventive measures in response to the Highly Pathogenic Avian Influenza (HPAI) H5N1 recommendations from the Florida Wildlife Commission issued in January 2022?** *

Mark only one oval.

- ☐ Yes, we implemented all the recommended preventive measures
- ☐ We implemented some of the recommended preventive measures
- ☐ No, we did not implement any preventive measures
- ☐ Other: _____

31. **30. If you implemented preventive measures for Highly Pathogenic Avian Influenza (HPAI) H5N1, how did it impact your daily wildlife rehabilitation operations?**

Mark only one oval.

1 2 3 4 5

Did it ☐ ☐ ☐ ☐ ☐ significantly impacted operations.

32. **31. Have you experienced any financial or resource constraints because of Highly Pathogenic Avian Influenza (HPAI) H5N1?** *

Mark only one oval.

☐ Yes

☐ No

33. **32. If you answered "Yes" to question 31, please briefly describe the financial or resource constraints faced, and any strategies employed to mitigate these challenges.**

34. **33. Have you encountered any cases of Highly Pathogenic Avian Influenza (HPAI) H5N1 in the bird species you have handled since January 2022?** *

Mark only one oval.

☐ Yes

☐ No

35. 34. If you answered yes in question 33, please provide details on the species observed and the number of cases for each species.

Mark only one oval per row.

	0	1	2	3	4	5+
Bald Eagle	☐	☐	☐	☐	☐	☐
Black Vulture	☐	☐	☐	☐	☐	☐
Blue-winged Teal	☐	☐	☐	☐	☐	☐
Brown Pelican	☐	☐	☐	☐	☐	☐
Great Horned Owl	☐	☐	☐	☐	☐	☐
Green-winged Teal	☐	☐	☐	☐	☐	☐
Kestrel	☐	☐	☐	☐	☐	☐
Lesser Scaup	☐	☐	☐	☐	☐	☐
Muscovy Duck	☐	☐	☐	☐	☐	☐
Mallard	☐	☐	☐	☐	☐	☐
Royal Tern	☐	☐	☐	☐	☐	☐
Sand Crane	☐	☐	☐	☐	☐	☐
White Pelican	☐	☐	☐	☐	☐	☐
Widgeon	☐	☐	☐	☐	☐	☐

Other

☐ ☐ ☐ ☐ ☐ ☐

36. **35. How has your profession as a bird rehabber changed as a result of Highly Pathogenic Avian Influenza (HPAI) H5N1?** *

Check all that apply.

- ☐ Changes in handling and care procedures for affected bird species
- ☐ Greater emphasis on surveillance and early detection of Avian Influenza
- ☐ Impacted ability to accept and rehabilitate certain bird species
- ☐ Increased collaboration and information-sharing with other rehabbers and relevant organizations
- ☐ Enhanced training and education on Avian Influenza prevention and management
- ☐ Increased administrative and paperwork requirements related to Avian Influenza
- ☐ Other: _____

37. **36. How would you like to receive future information and training on Highly Pathogenic Avian Influenza (HPAI) H5N1?** *

Check all that apply.

- ☐ Workshops or conferences organized by the Florida Wildlife Rehabilitators Association
- ☐ Training sessions conducted by state wildlife agencies or organizations (e.g., FWC)
- ☐ Online resources and webinars provided by reputable sources (e.g., CDC, USDA, etc.)
- ☐ Guidance and updates from national or regional bird rehabber associations
- ☐ Direct communication and guidance from state or local health authorities
- ☐ Peer-to-peer knowledge sharing within the bird rehabber community
- ☐ Other: _____

38. **37. Once Highly Pathogenic Avian Influenza (HPAI) H5N1 was established in Florida, did it impact your intake of birds?** *

Mark only one oval.

1 2 3 4 5

No i ☐ ☐ ☐ ☐ ☐ Significant impact

39. **38. If you experienced an impact on your bird intake after Highly Pathogenic Avian Influenza (HPAI) H5N1 was established, how did it impact you?**

40. **39. Once Highly Pathogenic Avian Influenza (HPAI) H5N1 was established in Florida, what were the criteria for accepting or refusing birds into your rehabilitation center?** *

Check all that apply.

- ☐ Based on observed clinical signs of Avian Influenza
☐ Restricting intake of bird species known to be susceptible to Avian Influenza
☐ Requiring laboratory testing for Avian Influenza prior to intake
☐ Following guidance from state or local health authorities
☐ Considering the bird's exposure history and potential risk of carrying Avian Influenza
☐ Collaborating with local wildlife agencies or organizations for intake decisions
☐ Implementing enhanced biosecurity measures for all bird admissions
☐ Other: _____

41. **40. Did you electively euthanize any birds because of Highly Pathogenic Avian Influenza (HPAI) H5N1?** *

Mark only one oval.

- ☐ Yes, I euthanized birds
☐ No, I did not euthanize birds

42. 41. If yes, what were the criteria you used to make that decision? **Check all that apply.*

- ☐ Severe clinical signs of Avian Influenza
- ☐ Confirmed laboratory diagnosis of Avian Influenza
- ☐ Unresponsive to treatment for Avian Influenza
- ☐ High risk of transmitting Avian Influenza to other birds
- ☐ Poor prognosis for recovery or quality of life
- ☐ Lack of resources or capacity to provide necessary care for Avian Influenza cases
- ☐ Guidance from state or local health authorities
- ☐ Not-applicable (answered NO above)
- ☐ High-risk species
- ☐ Other: _____

43. 42. After January 2022, did you continue to receive birds at your rehabilitation center? **Mark only one oval.*

- ☐ Yes, I continued to receive birds
- ☐ No, I temporarily stopped receiving birds

44. **43. If yes, what precautions did you implement to mitigate the risk of Highly Pathogenic Avian Influenza (HPAI) H5N1 transmission?** *

Check all that apply.

- ☐ Quarantine of incoming birds for a specific period
- ☐ All-in-all-out approach for bird intake and rehabilitation
- ☐ Revolving intake system with separate areas for incoming and rehabilitating birds
- ☐ Enhanced biosecurity measures (e.g., strict hand hygiene, disinfection protocols)
- ☐ Regular monitoring and testing of birds for Avian Influenza
- ☐ Restricted intake of bird species known to be susceptible to Avian Influenza
- ☐ Isolation of suspected or confirmed Avian Influenza cases
- ☐ Increased staff education and training on Avian Influenza prevention and control
- ☐ Not-applicable (answered NO above)
- ☐ Other: _____

45. **44. What personal protective equipment (PPE) did you use before January 2022 when dealing with suspected Highly Pathogenic Avian Influenza (HPAI) H5N1 cases? Please check all that apply.** *

Check all that apply.

- ☐ Disposable gloves
- ☐ Surgical masks
- ☐ N95 respirators
- ☐ Protective goggles or face shield
- ☐ Disposable gowns or coveralls
- ☐ Shoe covers
- ☐ Hand sanitizers or hand hygiene products
- ☐ Other: _____

46. **45. What personal protective equipment (PPE) did you use between January 2022 and June 2023 when dealing with suspected Highly Pathogenic Avian Influenza (HPAI) H5N1 cases? Please check all that apply.** *

Check all that apply.

- ☐ Disposable gloves
- ☐ Surgical masks
- ☐ N95 respirators
- ☐ Protective goggles or face shield
- ☐ Disposable gowns or coveralls
- ☐ Shoe covers
- ☐ Hand sanitizers or hand hygiene products

47. **46. What personal protective equipment (PPE) do you use now, after July 01, 2023, when dealing with suspected Highly Pathogenic Avian Influenza (HPAI) H5N1 cases? Please check all that apply.** *

Check all that apply.

- ☐ Disposable gloves
- ☐ Surgical masks
- ☐ N95 respirators
- ☐ Protective goggles or face shield
- ☐ Disposable gowns or coveralls
- ☐ Shoe covers
- ☐ Hand sanitizers or hand hygiene products

48. **47. After January 2022, did you start testing birds for Highly Pathogenic Avian Influenza (HPAI) H5N1?** *

Mark only one oval.

- ☐ Yes, I tested birds for Avian Influenza
- ☐ No, I did not test birds for Avian Influenza

49. 48. If yes, when did you test the birds? Please select all that apply. **Check all that apply.*

- ☐ Before bird intake
- ☐ If birds were showing clinical signs of Avian Influenza
- ☐ Before bird release from rehabilitation
- ☐ Not-applicable (answered NO above)
- ☐ Other: _____

50. 49. Between January 2022 and June 2023, if you tested a bird for Highly Pathogenic Avian Influenza (HPAI) H5N1 and it was positive, what actions did you take? Please select all that apply. **Check all that apply.*

- ☐ Isolated the infected bird from other birds
- ☐ Implemented enhanced biosecurity measures in the facility
- ☐ Consulted with veterinary experts or avian health professionals
- ☐ Reported the positive test results to relevant authorities
- ☐ Euthanized the infected bird
- ☐ Provided supportive care and treatment for the infected bird
- ☐ Tested other birds in the facility for Avian Influenza
- ☐ Increased monitoring and surveillance for Avian Influenza cases in the facility
- ☐ Retested the bird
- ☐ Not applicable
- ☐ Other: _____

51. 50. Between January 2022 and June 2023, did you confirm any bird-to-bird transmission of Highly Pathogenic Avian Influenza (HPAI) H5N1 within your facility? **Mark only one oval.*

- ☐ Yes, bird-to-bird transmission was confirmed within my facility
- ☐ No, bird-to-bird transmission was not confirmed within my facility

52. 51. If yes, what measures did you take? Please select all that apply. **Check all that apply.*

- ☐ Isolated the affected birds from other birds
- ☐ Implemented stricter biosecurity protocols within the facility
- ☐ Conducted additional testing of potentially exposed birds
- ☐ Enhanced cleaning and disinfection practices
- ☐ Modified the facility layout to minimize contact between birds
- ☐ Sought guidance from veterinary experts or avian health professionals
- ☐ Reported the occurrence of bird-to-bird transmission to relevant authorities
- ☐ Euthanized affected birds to prevent further transmission
- ☐ Increased monitoring and surveillance for Avian Influenza cases within the facility
- ☐ Not-applicable (answered NO above)
- ☐ Other: _____

53. 52. Before January 2022, what measures did you take to protect birds in your facility from Highly Pathogenic Avian Influenza (HPAI) H5N1? Please select all that apply. **Check all that apply.*

- ☐ Enhanced biosecurity protocols (e.g., stricter disinfection practices, restricted visitor access)
- ☐ Implemented separate quarantine areas for incoming birds
- ☐ Increased monitoring and surveillance for Avian Influenza cases
- ☐ Conducted regular testing of birds for Avian Influenza
- ☐ Modified intake procedures to prioritize non-affected bird species
- ☐ Provided staff education and training on Avian Influenza prevention and control
- ☐ Updated facility layout to minimize cross-contamination between bird populations
- ☐ Established or strengthened collaboration with veterinary experts or avian health professionals
- ☐ Implemented all-in-all-out approach for bird intake and rehabilitation
- ☐ Other: _____

54. **53. Between January 2022 and June 2023, what measures did you take to protect birds in your facility from Highly Pathogenic Avian Influenza (HPAI) H5N1? Please select all that apply.** *

Check all that apply.

- ☐ Enhanced biosecurity protocols (e.g., stricter disinfection practices, restricted visitor access)
- ☐ Implemented separate quarantine areas for incoming birds
- ☐ Increased monitoring and surveillance for Avian Influenza cases
- ☐ Conducted regular testing of birds for Avian Influenza
- ☐ Modified intake procedures to prioritize non-affected bird species
- ☐ Provided staff education and training on Avian Influenza prevention and control
- ☐ Updated facility layout to minimize cross-contamination between bird populations
- ☐ Established or strengthened collaboration with veterinary experts or avian health professionals
- ☐ Implemented all-in-all-out approach for bird intake and rehabilitation
- ☐ Other: _____

55. **54. After July 01, 2023, what measures have you been taking to protect birds in your facility from Highly Pathogenic Avian Influenza (HPAI) H5N1? Please select all that apply.** *

Check all that apply.

- ☐ Enhanced biosecurity protocols (e.g., stricter disinfection practices, restricted visitor access)
- ☐ Implemented separate quarantine areas for incoming birds
- ☐ Increased monitoring and surveillance for Avian Influenza cases
- ☐ Conducted regular testing of birds for Avian Influenza
- ☐ Modified intake procedures to prioritize non-affected bird species
- ☐ Provided staff education and training on Avian Influenza prevention and control
- ☐ Updated facility layout to minimize cross-contamination between bird populations
- ☐ Established or strengthened collaboration with veterinary experts or avian health professionals
- ☐ Implemented all-in-all-out approach for bird intake and rehabilitation
- ☐ Other: _____

56. **55. Before January 1, 2022, did you treat Muscovy ducks? ***

Mark only one oval.

- ☐ Yes, I treated Muscovy ducks before January 2022
- ☐ No, I did not treat Muscovy ducks before January 2022

57. **56. After January 1, 2022, did you treat Muscovy ducks? ***

Mark only one oval.

- ☐ Yes, I treated Muscovy ducks after January 2022
- ☐ No, I did not treat Muscovy ducks after January 2022

58. **57. Before January 2022, did you keep any poultry on your premises? ***

Mark only one oval.

- ☐ Yes, I kept poultry on my premises before January 2022
- ☐ No, I did not keep poultry on my premises before January 2022

59. **58. After January 2022, did you keep any poultry on your premises? ***

Mark only one oval.

- ☐ Yes, I kept poultry on my premises after January 2022
- ☐ No, I did not keep poultry on my premises after January 2022

60. **59. Does your facility maintain resident educational birds? ***

Mark only one oval.

- ☐ Yes
- ☐ No

61. 60. If yes, please provide details on the species of educational birds and the number of each species. *

Mark only one oval per row.

	0	1	2	3	4	5+
Bald Eagle	☐	☐	☐	☐	☐	☐
Black Vulture	☐	☐	☐	☐	☐	☐
Blue-winged Teal	☐	☐	☐	☐	☐	☐
Brown Pelican	☐	☐	☐	☐	☐	☐
Great Horned Owl	☐	☐	☐	☐	☐	☐
Green-winged Teal	☐	☐	☐	☐	☐	☐
Kestrel	☐	☐	☐	☐	☐	☐
Lesser Scaup	☐	☐	☐	☐	☐	☐
Muscovy Duck	☐	☐	☐	☐	☐	☐
Mallard	☐	☐	☐	☐	☐	☐
Royal Tern	☐	☐	☐	☐	☐	☐
Sand Crane	☐	☐	☐	☐	☐	☐
White Pelican	☐	☐	☐	☐	☐	☐
Widgeon	☐	☐	☐	☐	☐	☐

62. **61. If you responded Yes to question 59, and the education birds that you house are not listed in the table above, please provide your response here:** *

63. **62. If you maintain resident educational birds, do you have a separate building away from your primary treatment facility?** *

Mark only one oval.

- ☐ Yes
☐ No
☐ Not Applicable (we do not have educational birds)

64. **63. If you maintain resident educational birds, do you have a separate dedicated staff to manage the educational birds separately from the rehabilitation birds?** *

Mark only one oval.

- ☐ Yes
☐ No
☐ Not Applicable (we do not have educational birds)

65. **64. Which of the following best describes your resources to manage a biosecurity program for Highly Pathogenic Avian Influenza (HPAI) H5N1?** *

Mark only one oval.

- ☐ I have sufficient resources (financial, personnel, and equipment) to implement and maintain a comprehensive biosecurity program.
- ☐ I have limited resources, but I can allocate some funds and effort towards implementing a basic biosecurity program.
- ☐ I have minimal resources and cannot currently invest in a biosecurity program for avian influenza.
- ☐ I am unsure about the resources required for a biosecurity program for avian influenza.
- ☐ Other: _____

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Portfolio B



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Recommendations to Reduce the risk of Highly Pathogenic Avian Influenza HPAI H5N1 Transmission in Wildlife Rehabilitation Centers

October 20, 2023

Florida Fish and Wildlife Conservation Commission / Fish and Wildlife Health

In January 2022 Highly Pathogenic Avian Influenza (HPAI) virus (H5N1 Eurasian strain) was detected in hunter-harvested blue-winged teal in Palm Beach County. Although there have been only rare human infections in the in the US, this strain of HPAI can infect at-risk people, birds, and other mammals; personnel involved with wildlife rehabilitation are at increased risk.

All wildlife rehabilitators should be aware of these facts and take proper safety precautions.

- Some avian species, e.g., waterfowl, may be infected with HPAI without showing clinical signs.
- Domestic birds and wild birds, including waterfowl, other aquatic birds, raptors, and scavengers (gulls, ravens, crows) are at higher risk for infection.
- Any bird should be considered susceptible, especially in a rehabilitation setting where there is close contact among birds.
- Clinical signs in infected birds can range from asymptomatic, to gastrointestinal, to respiratory, to neurologic disease, and death. The clinical signs are not specific and could be due to other causes (HPAI cannot be diagnosed based on clinical signs alone).
- The virus is highly transmissible to poultry and domestic chickens, ducks, turkeys, etc., and any direct or indirect exposure of infected wildlife to poultry must be avoided.
- The avian influenza virus is shed through all excretions (oronasal and fecal).
- Although there is low risk for human infection with the current HPAI H5N1 strain, wildlife rehabilitators, especially those who frequently work with wild birds and waterfowl, are at increased risk for exposure.

Avian influenza is a reportable disease and by law must be reported to the Florida Department of Agriculture and Consumer Services (FDACS, (850) 410-0900 (during office hours) or 1-800-342- 5869 (after hours) or email RAD@FDACS.gov) or USDA-Veterinary Services if suspected.

Isolate/quarantine any birds on intake suspected of having an infectious disease.

- Protect yourself and your staff with the appropriate use of personal protective equipment (PPE), including at least dedicated outerwear (washable or disposable), disposable gloves, N95 masks, and eye protection.
- Consider immediate euthanasia of waterfowl, raptors, or scavengers with unexplained neurologic, gastrointestinal, or respiratory symptoms.
- While wearing appropriate PPE, collect oropharyngeal and cloacal swabs from suspected bird. Cloacal samples may be combined for each bird in a labeled BHI broth with antibiotics vial and submitted to an approved laboratory for Avian Influenza testing.
- Carcasses from euthanasia and/or natural mortality should be double-bagged, the outside of the outer bag must be disinfected, and the carcasses must be stored in a refrigerator or freezer labeled "Not for Food Use."
 - Contact FWC or FDACS for necropsy/disposal information. **FWC is coordinating the necropsy and testing of suspect waterfowl and aquatic birds, raptors, and scavengers (call 866-293-9282)**
- Test any birds and ensure negative results *before* transferring them to your facility.
- House education birds, and other non-releasable birds, in a separate facility away from other birds if possible. Have separate and dedicated staff care for resident birds, and not handle any potentially infected birds.

FWC HPAI Wildlife Rehabilitator Guidelines

Page 2

October 20, 2023

If you choose to hospitalize and treat suspect birds pending results of HPAI H5N1 test results, the recommendations below may help reduce risk. It must be stressed that infection control with HPAI H5N1 in hospital or rehabilitation settings is profoundly difficult and likely beyond the capacity of most wildlife rehabilitation hospitals:

- Always don and doff dedicated PPE (disposable gloves, booties, and N95 mask or equivalent; eye protection; dedicated washable or disposable Tyvek outerwear)
<https://www.cdc.gov/flu/avianflu/h5/worker-protection-ppe.htm>
- Refer the CDC Workplace safety guidelines for Protecting Poultry Workers
<https://www.cdc.gov/niosh/docs/2008-128/pdfs/2008-128.pdf>
- Identify and designate a quarantine in a room away from other birds and mammals. This room would preferably be in a separate building or location with a separate entrance.
- Provide adequate air exchange and air filtration.
- Use a footbath with disinfectant (quaternary ammonia compounds, virucide, or 10% bleach solutions) at the room entrance/exit.
- Wash cages thoroughly with soap and water to remove any organic debris, allow 20 seconds of soap contact time with the cage surface before rinsing and disinfecting.
- Disinfect cages with a 10% bleach solution or hospital grade virucide for disinfection. Allow adequate contact time of at least 30 seconds.
- Contaminated cage liners/supplies/materials should be double bagged for disposal.
- Please refer to the USDA poultry biosecurity recommendations for more details
<https://www.aphis.usda.gov/aphis/ourfocus/animalhealth/animal-disease-information/avian/defend-the-flock-program/df-biosecurity>
- Do not transport affected birds from one facility to another unless the birds have been confirmed HPAI test negative.
- Have designated personnel care for quarantined birds. If this is not possible then care for quarantined birds last.
- Staff caring for affected birds should not handle, or have contact with, domestic poultry at the rehab facility, home, or elsewhere.
- Wash hands well with soap and water after handling affected birds, contaminated surfaces, or contaminated materials. Do not eat, drink, or smoke while treating affected birds or cleaning/disinfecting cages.
- Consider vaccination for seasonal influenza and current bivalent COVID-19 to reduce the risk of co-infection.
- If you develop flu-like symptoms, seek prompt medical care, and let your provider know you have regular contact with wildlife including wild birds.
- Please report any bird die-offs or unusual mortality events within your facility by entering the information into the bird mortality database
<https://app.myfwc.com/FWRI/AvianMortality/>

If HPAI is detected in a bird at your facility:

- Immediately notify FWC (FDACS and USDA should also be made aware).
- Do not take in or release any birds or mammals.
- Euthanize the HPAI-positive bird, double-bag (disinfect the outside of the bag) and save frozen.
- FDACS and/or FWC may conduct a foreign animal disease investigation, and it is possible that any exposed birds would be euthanized.
- Facility must be thoroughly cleaned and disinfected.

Questions or concerns? Please contact Becky Hardman rebecca.hardman@myfwc.com or Mark Cunningham at mark.cunningham@myfwc.com or 352-494-4229. For more information see our website at <https://myfwc.com/research/wildlife/health/avian/influenza/>

Portfolio C



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Recommendations for the Florida Wildlife Commission to Better Communicate the risk of Infectious Diseases with Wildlife Rehabilitation Centers

October 12, 2023

Florida Fish and Wildlife Conservation Commission / Fish and Wildlife Health

Background:

In January 2022 Highly Pathogenic Avian Influenza (HPAI) virus (H5N1 Eurasian strain) was detected in hunter-harvested blue-winged teal in Palm Beach County. Although there have been only rare human infections in the in the US, this strain of HPAI can infect at-risk people, birds, and other mammals; personnel involved with wildlife rehabilitation are at increased risk.

All wildlife rehabilitators should be aware of these facts and take proper safety precautions.

While this situation involved Highly Pathogenic Avian Influenza (HPAI), any number of zoonotic infectious disease agents could be responsible for the next outbreak of importance for the state of Florida and avian rehabilitators. It is important to understand how well the avian rehabilitators in Florida understand infectious diseases, and it is also important to provide training, information, and education in ways that optimize the transfer and update of information.

Following the 2022-2023 HPAI H5N1 outbreak in Florida, a survey was conducted of avian rehabilitation organizations to help characterize their knowledge of HPAI, how they reacted to the disease before, during, and after the outbreak, and how they would prefer to receive information on the disease.

Overarching findings:

- Among the avian rehabilitators who responded, there is a wide range of understanding about infectious disease and responses to outbreaks.
- With HPAI H5N1, euthanasia was a key to controlling the spread of disease.
- There was little change in the use of PPE among respondents from before the event, during the event, and after the event.
- Avian rehabilitators are looking for a variety of opportunities to receive training on infectious diseases.
- Avian rehabilitators felt that they had limited resources with which to respond to the outbreak of HPAI H5N1

Key HPAI H5N1 learnings:

- 85% of respondents continued to receive birds after the HPAI H5N1 outbreak was identified
- 50% of respondents reported encountering rehabilitated birds with suspected HPAI H5N1
- 20% of respondents reported taking no measures to reduce the spread of HPAI H5N1
- 75% of respondents relied on clinical signs for diagnosis of HPAI H5N1
- Despite HPAI being a reportable disease and by law must be reported to the Florida Department of Agriculture and Consumer Services, only 65% of respondents reported having a protocol in place to report the disease.
- 85% of respondents reported monitoring government/health agency sites to get updates on HPAI.
- The most common steps identified by respondents to prepare for future HPAI outbreaks are:
 - Training staff on HPAI (85%)
 - Acquire the necessary personnel protective equipment (PPE) (75%)
 - Establishing partnerships with avian health professionals or local authorities (75%)
- 55% of respondents reported implementing strict quarantine for all new arrivals.
- No (0%) respondents indicated any bird-to-bird transmission of HPAI H5N1
- Diagnostic testing of birds remained low during the active outbreak with only 60% testing
- 30% of respondents "strongly agreed" that personnel received training or education on HPAI.

Recommendations for future infectious disease outbreaks:

- Resource allocation is key. Only 10% of respondents indicated that they had sufficient resources to manage a biosecurity program.
- Educational birds are a big part of the rehabilitator program (70% maintain resident birds)
 - Staff training on biosecurity is vital, as 40% of respondents do not have dedicated staff to handle potentially sick birds separately from educational birds.
- 1 in 5 facilities keep poultry on their premises, so education on biosecurity, PPE use, and disease containment training is critical.
- Many facilities rely on clinical signs for diagnosis. Training on the need for proper diagnostic testing is important to understand the scope of disease.
- Euthanasia of affected birds remains an important way to reduce the spread of disease and human exposure to infectious disease agents.
- The most requested method to receive information on disease outbreaks is from regional or national avian rehabilitator associations, followed by online updates from government organizations such as USDA and CDC.

Questions or concerns? Please contact Mark Cunningham at mark.cunningham@myfwc.com or 352-494-4229.

For more information see our website: <https://myfwc.com/research/wildlife/health/avian/influenza/>