Animal and Plant Health Inspection Service
U.S. DEPARTMENT OF AGRICULTURE

Emergency Response for Highly Pathogenic Avian Influenza Outbreaks in Seven States

Final Environmental Assessment

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List of Abbreviations and Terms

AHPA	Animal Health Protection Act
AI	avian influenza
APHIS	Animal and Plant Health Inspection Service (USDA)
AVMA	American Veterinary Medical Association
CDC	Centers for Disease Control and Prevention
CEQ	Council on Environmental Quality, The White House
CFR	Code of Federal Regulations
CH_4	methane
CO	carbon monoxide
CO_2	carbon dioxide
EA	environmental assessment
EIS	environmental impact statement
EO	Executive Order
ERAS	USDA APHIS Policy and Program Development, Environmental and Risk Analysis Services
EWG	Encyclopedia of World Geography
FONSI	Finding of No Significant Impact
ft	feet
H	protein hemagglutinin
H5N1	HPAI A(H5N1); subtype of influenza A virus
HPAI	highly pathogenic avian influenza
ICP	Incident Command Post
KED	Koechner Euthanizing Device
km	kilometer
LPAI	low pathogenic avian influenza
m	meter(s)
MBTA	Migratory Bird Treaty Act of 1918
mi	mile(s)
MOU	memorandum of understanding
n.d.	undated
N	protein neuraminidase
NH_3	ammonia
N_2O	nitrous oxide
NO_x	nitrogen oxides
NO_2	nitrogen dioxide
NAAQS	National Ambient Air Quality Standards
NASS	National Agricultural Statistics Service
NEPA	National Environmental Policy Act of 1969, as amended
NPIP	National Poultry Improvement Plan
OIE	World Organization for Animal Health
ONTL	USDA APHIS Office of National Tribal Liaison
OTR	USDA Office of Tribal Relations
PFAS	perfluoroalkyl and polyfluoroalkyl substances
PFOS	perfluorooctane sulfate
$PM_{2.5}$	fine particulate matter
PPE	personal protective equipment

RCRA	Resource Conservation and Recovery Act
SO_2	sulfur dioxide
TED	Turkey Euthanasia Device
U.S.	United States
U.S.C.	United States Code
USCB	United States Census Bureau
USDA	United States Department of Agriculture
USDI	United States Department of Interior
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service (USDI)
VS	USDA APHIS Veterinary Services
VSD	ventilation shutdown
VSD+	ventilation shutdown plus
WS	USDA APHIS Wildlife Services
°C	degrees Celsius
°F	degrees Fahrenheit

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1 Introduction

1.1 Background

The United States Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), Veterinary Services (VS) is responsible for protecting and improving the health, quality, and marketability of United States (U.S.) animals, and animal products by (1) preventing, controlling, and/or eliminating animal diseases, and (2) monitoring and promoting animal health and productivity. The authority for the mission of VS is found in the Animal Health Protection Act (AHPA) (7 United States Code (U.S.C.) 8301 *et seq*.), as discussed in Section 1.3.

Avian influenza (AI), commonly known as bird flu, is a respiratory (affecting airways) or systemic (affecting the entire body) disease. Many strains of the AI virus are present worldwide, and each strain can cause varying degrees of illness, which may not be restricted to bird species. Two forms of AI that can spread through poultry include low pathogenic avian influenza (LPAI) and highly pathogenic avian influenza (HPAI). HPAI is an extremely infectious and fatal form of the disease that, once established, rapidly spreads within and between flocks (USDA APHIS 2022b). Appendix B provides further background information regarding the AI virus. This environmental assessment (EA) focuses on HPAI viruses found in poultry, which may include domestic chickens, turkeys, guineafowl, peafowl, ratities (emus and ostriches), pheasant, and quail, and any other fowl kept for meat, egg, or feather production.

HPAI is an emerging disease of domestic poultry and wild birds in the United States and outbreaks continue to occur sporadically (Ramey et al. 2022). In February of 2004, the first outbreak of HPAI in the United States for 20 years occurred in Texas (USDA APHIS 2015e). From December 2014 until June 2015, the United States experienced more than 200 HPAI outbreaks affecting commercial and backyard flocks in the central and northwestern regions. Additional outbreaks occurred in Indiana beginning in January 2016 (USDA APHIS 2016b), in Tennessee in March 2017 (CDC, 2018), and in South Carolina in April 2020 (USDA APHIS 2020d). In each case, USDA APHIS VS worked closely with state agencies to quickly identify and eradicate the virus.

The USDA APHIS (2017e) HPAI Preparedness and Response Plan, known as *The Red Book*, describes organizational information, policy decisions, and updated strategies on how to address HPAI outbreaks. The plan promotes improved biosecurity practices and HPAI surveillance; expanded response capabilities, including availability of personnel equipment and depopulation, disposal, and recovery options; improved capabilities to rapidly detect HPAI in domestic poultry and depopulate affected flocks within 24-48 hours (or as soon as possible after)[1] of a presumptive positive; and enhanced communication (USDA APHIS 2017e; 2022d). The plan "*gives direction to emergency responders at the Federal, State, Tribal, local, and industry levels to facilitate HPAI*

[1] USDA APHIS VS sets a goal of 24-48 hours for depopulation to ensure minimal spread, but unforeseen conditions may make this undoable.

control and eradication efforts in poultry in the United States" but it "*complements, not replaces, existing regional, State, Tribal, local, and industry plans*." USDA APHIS (2022d) created a webpage where response actions, policy, historic information on HPAI, and the USDA APHIS response plan, as well as other educational outreach materials, can be found to inform the public of the seriousness of this disease (USDA APHIS | Highly Pathogenic Avian Influenza (HPAI)). USDA APHIS VS can provide guidance and recommendations on methods of depopulation and disposal, but ultimately, the states make their own choice and USDA APHIS VS generally does not overrule them. But, for the most part, *The Red Book* provides the recommended strategies which are generally taken.

1.2 Purpose and Need

The establishment of HPAI in the United States is of great concern to USDA, the poultry industry, and others, and could arise as a result of any individual HPAI outbreak. Outbreaks of HPAI in U.S. commercial poultry operations are not common, but when they do occur, they can be substantial as was the case of the HPAI outbreaks in 2014-15, which caused the loss of approximately 7.4 million turkeys and 43 million chickens (USDA APHIS 2017e). A widespread outbreak could have severe economic consequences to the poultry industry in the United States and, although transmission to humans has been rare, this highly mutable disease could pose a risk to humans that come into close contact with infected poultry (USDA APHIS 2017e).

Once HPAI-infected birds are positively identified, rapid stamping-out (i.e., bringing under control) is needed to prevent continued HPAI virus shedding and spreading. The amount of virus produced by infected birds is significant; the more virus that exists, the harder it is to control and contain an outbreak. Environmental contamination becomes a challenge when depopulation is delayed because the virus is continually being shed and can result in further HPAI transmission.

Preventing the entry of diseased birds and eggs into the United States, monitoring AI in migratory birds, identifying AI strains occurring primarily in migratory waterbird species as well as non-commercial backyard and commercial poultry flocks, and stamping out HPAI as it arises in domestic poultry is important for the long-term maintenance of disease-free U.S. poultry stocks. For example, consumers are affected by higher prices for poultry products such as eggs when an HPAI outbreak occurs (USDA ERS 2018).

USDA APHIS (2022b) monitors wild and domestic birds throughout the United States to ensure that this highly contagious disease is identified where it arises, and surveillance efforts are concentrated where disease outbreaks will likely occur based on patterns of wild bird movements. It is not uncommon to detect avian influenza in wild birds, as avian influenza viruses circulate freely in those populations without the birds appearing sick. In addition to monitoring for avian influenza in wild bird populations, USDA APHIS monitors for the virus in commercial and backyard birds. USDA APHIS works closely with Federal and State partners on surveillance, reporting, and control efforts.

Waterfowl and waterbirds are of particular interest because they are often indicator species of HPAI, especially those that migrate from the Arctic where North American species intermingle with Eurasian species on breeding grounds. USDA APHIS Wildlife Services (WS) in coordination with USDA APHIS VS conducts surveillance of wild birds for HPAI throughout the United States. From January 1 to August 9, 2022, USDA APHIS WS detected 2,044 cases of HPAI in wild birds (see Figure 1), primarily in hunter-harvested, trapped, sampled, and released waterfowl, and from found wild bird mortalities or those taken for other wildlife damage management activities. These detections included several species of waterfowl (ducks, geese, swans), waterbirds (grebes, loons, cormorants, pelicans), wading birds (herons, egrets, cranes, storks), gulls and terns, shorebirds, raptors (vultures, eagles, hawks, owls, falcons), turkeys and pheasants, and songbirds (ravens, crows, magpies, robin, blackbirds, and junco) in 44 states and the District of Columbia (USDA APHIS 2022a).

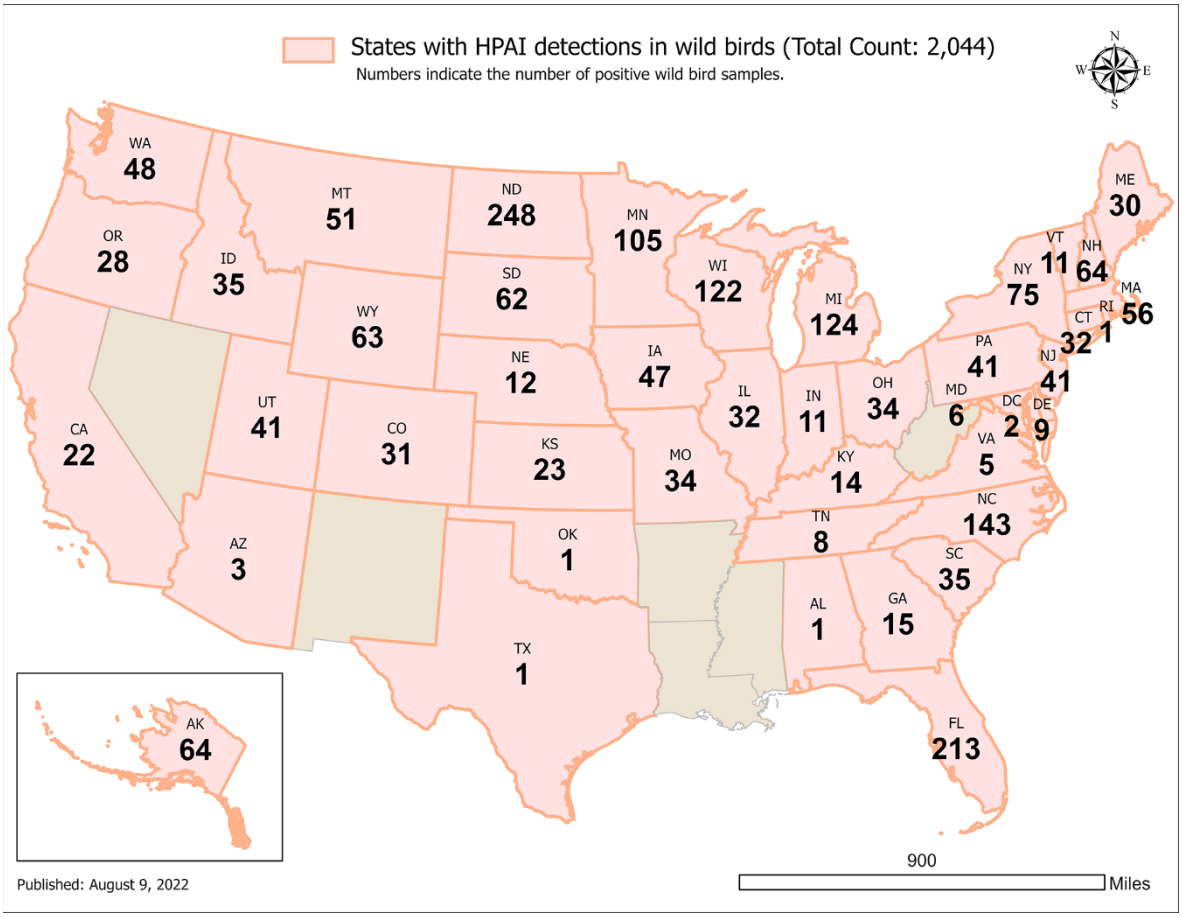

Figure 1. HPAI detections in wild birds from January 1 until August 9, 2022.

Source: (USDA APHIS 2022a).

USDA APHIS VS conducts surveillance of poultry throughout the United States, especially where large numbers of birds have died or in zones surrounding HPAI detections. On February 8, 2022,

USDA APHIS VS confirmed the detection of HPAI (H5N1[2]) in a commercial poultry flock in Dubois County, Indiana. By February 24th, H5N1 was detected in domestic poultry and birds in additional locations in Indiana, Kentucky, Virginia, New York, Maine, Delaware, and Michigan. Since February 24 and the publishing of the draft EA, additional outbreaks have occurred in both commercial and backyard flocks in five of these states (see Figure 2). To date, commercial poultry premises in a total of three counties in Indiana; two counties in Kentucky; two counties in Delaware, one county in Michigan, and one county in New York, and backyard bird flocks in two counties in Indiana; six counties in Maine; eight counties in Michigan; six[3] counties in New York; and one county in Virginia have been infected with H5N1 HPAI. All the affected premises with HPAI outbreaks in these states are listed in Table 1. In addition to the new outbreaks in these states, 32 other states have seen HPAI outbreaks since February 24. A supplemental National Environmental Policy Act (NEPA) document covering states where new HPAI outbreaks have occurred since February 24th, including the states covered in this EA, is being prepared.

Table 1 summarizes information for the outbreak locations in Indiana, Kentucky, Virginia, New York, Maine, Delaware, and Michigan, including descriptions of the infected flocks, the depopulation methods used and the time to complete depopulation, and the disposal methods utilized. Depopulation and disposal of poultry at commercial facilities and backyard flocks have been completed in these seven states. All affected premises have been cleaned and disinfected or are utilizing a 150-day fallow period in place of virus elimination. Surveillance activities have been completed, quarantine has been released, and restocking of poultry has been approved at many locations.

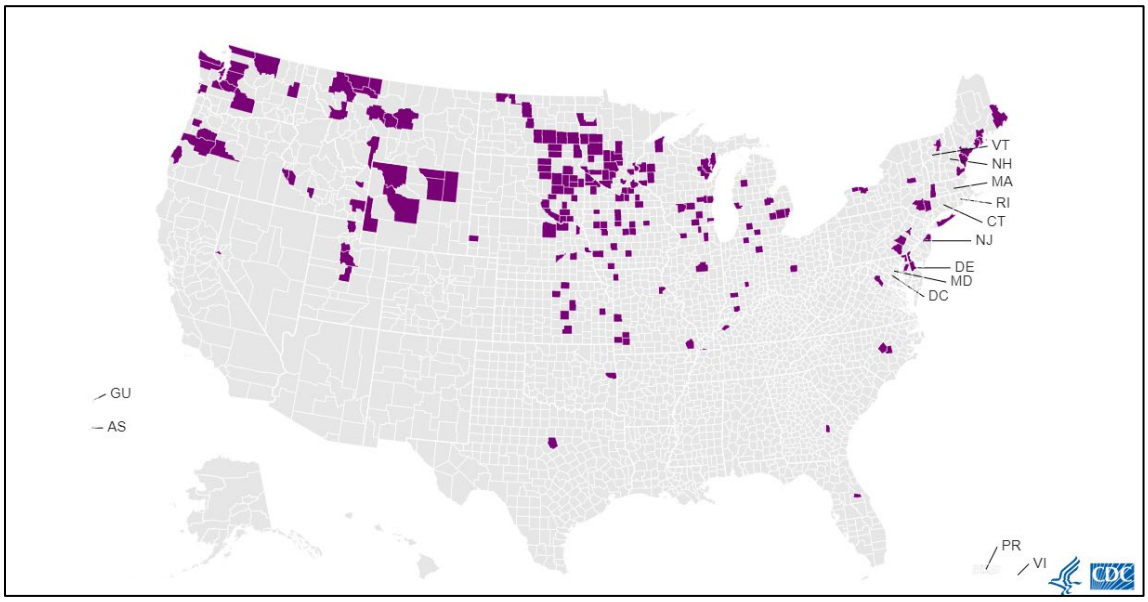

Figure 2. Counties with HPAI outbreaks in 2022.

Source: (CDC 2022c).

[2] The significance of the H5N1 strain and other HPAI strains is discussed in detail in Appendix B.

[3] One location had captive wild birds.

USDA APHIS VS initiated an emergency response in February 2022 for the HPAI outbreaks and the White House Council on Environmental Quality (CEQ) was notified per 7 Code of Federal Regulation (CFR) 372.10(b) of USDA APHIS's alternative arrangements for compliance with NEPA and the intent to prepare an EA, which is discussed in more detail in Section 1.3 below. Therefore, actions to stamp out HPAI at those sites have been or will mostly be completed prior to this EA being put out for public notice. This emergency EA evaluates the potential environmental impacts from USDA APHIS VS working in close coordination with state and local authorities and affected owners to continue to monitor those sites and respond to future HPAI outbreaks in the seven states. These activities would potentially include monitoring wild birds and poultry, depopulating and disposing of HPAI-infected domestic poultry flocks, disinfecting premises, and conducting follow up monitoring and quarantine release. Similar responses and activities would occur in any additional states where HPAI would be detected and supplemental NEPA analysis of potential environmental impacts will be prepared for outbreaks in any additional states.

Table 1. Summary of 2022 HPAI outbreak locations, infected flocks, and depopulation and disposal methods used.

State	County	Flock Type	Number in Flock*	Depopulation Method	Time to Complete Depopulation (days)	Disposal Method
Delaware	Kent 01	Commercial	147,753	Foam, VSD+heat	2	Indoor/ Outdoor compost
	New Castle 01	Commercial	1,046,937	Whole house CO_2; CO_2 cart; VSD+heat	7	Outdoor compost
	New Castle 02	Commercial	243,900	CO_2 cart; VSD+heat	3	Outdoor compost
Indiana	Allen 01	Backyard	7 (2)	Injectable	1	Incineration
	Allen 02	Backyard	114	Injectable	1	On-site burial
	Allen 03	Backyard	41	Injectable	1	Incineration
	Dubois 01	Commercial	29,015 (28,915)	Foam	2	Indoor compost
	Dubois 02	Commercial	26,625 (26,473)	Foam	1	Indoor compost
	Dubois 03	Commercial	35,998 (35,908)	Foam	2	Indoor compost
	Dubois 04	Commercial	16,494 (16,479)	Foam	1	Indoor compost
	Elkhart 01	Commercial	4,724 (4,679)	KEDs (cervical dislocation)	1	Outdoor compost
	Elkhart 02	Commercial	6,379	KEDs (cervical dislocation); TEDs (captive bolt)	2	On-site burial
	Elkhart 03	Commercial	6,600	Cervical dislocation	2	Outdoor compost

State	County	Flock Type	Number in Flock*	Depopulation Method	Time to Complete Depopulation (days)	Disposal Method
	Greene 01	Commercial	48,211 (48,049)	Foam	2	Indoor compost
	Greene 02	Commercial	15,400	Foam	1	Indoor compost
	Johnson 01	Backyard	40 (30)	Cervical dislocation; injectable	2	On-site burial; incineration
Kentucky	Fulton 01	Commercial	231,398	Foam; VSD+heat; cervical dislocation	2	Indoor compost
	Webster 01	Commercial	53,286	Foam; VSD+heat	2	Indoor compost
Maine	Cumberland 01	Backyard	247 (177)	CO_2 cart/container	1	Outdoor compost – off-site facility
	Cumberland 02	Backyard	15 (2)	Injectable	1	Incineration
	Knox 01	Backyard	27 (17)	CO_2 cart/container	1	Outdoor compost – off-site facility
	Knox 02	Backyard	96 (90)	CO_2 cart/container	1	Indoor compost – off-site facility
	Knox 03	Backyard	19 (6)	CO_2 cart/container	1	Incineration
	Knox 04	Backyard	43 (4)	CO_2 cart/container	1	Incineration
	Lincoln 01	Backyard	98	CO_2 cart/container	1	Outdoor compost – off-site facility
	Lincoln 02	Backyard	29 (13)	CO_2 cart/container	1	Outdoor compost – off-site facility
	Lincoln 03	Backyard	3 (1)	Injectable	1	Incineration
	Waldo 01	Backyard	47 (23)	CO_2 cart/container	1	Incineration
	Washington 01	Backyard	18	CO_2 cart/container	1	Incineration
	York 01	Backyard	184	CO_2 cart/container	2	Outdoor compost – off-site facility
	York 02	Backyard	65 (60)	CO_2 cart/container	1	Outdoor compost – off-site facility
Michigan	Branch 01	Backyard	18 (3)	Injectable	1	Incineration
	Kalamazoo 01	Backyard	34 (15)	CO_2 cart/container	1	Incineration
	Livingston	Backyard	20 (10)	CO_2	1	Incineration

State	County	Flock Type	Number in Flock*	Depopulation Method	Time to Complete Depopulation (days)	Disposal Method
	01			cart/container		
	Macomb 01	Backyard	66 (57)	Injectable	1	Incineration
	Macomb 02	Backyard	42 (20)	CO_2 cart/container	1	Incineration
	Menominee 01	Backyard	67 (64)	CO_2 cart/container	1	Landfill
	Menominee 02	Backyard Commercial	351 (236)	CO_2 cart/container	1	Landfill
	Menominee 03	Backyard	25 (16)	Injectable	1	Incineration
	Menominee 04	Backyard	35 (24)	CO_2 cart/container	1	Landfill
	Muskegon 01	Commercial	35,132 (33,977)	VSD+heat	1	Indoor compost
	Oakland 01	Backyard	46 (39)	CO_2 cart/container	1	Incineration
	Saginaw 01	Backyard	75 (33)	CO_2 cart/container	1	Incineration
	Wexford 01	Backyard Commercial	65 (43)	CO_2 cart/container	1	Incineration
New York	Dutchess 01	Backyard	195 (166)	Cervical dislocation	1	Incineration
	Fulton 01	Backyard	4 (3)	KEDs (cervical dislocation)	1	Incineration
	Monroe 01	Backyard	400 (265)	CO_2 cart/container	1	Off-site - outdoor compost
	Orleans 01	Backyard	31 (2)	KEDs (cervical dislocation)	1	Incineration
	Suffolk 01	Backyard	8 (2)	Cervical dislocation	1	Incineration
	Suffolk 02	Commercial	8,507	CO_2 cart/container	4	Outdoor compost
	Suffolk 03	Backyard	285	CO_2 cart/container	1	Outdoor compost @ Suffolk 02
	Ulster 01	Backyard	65 (59)	KEDs (cervical dislocation); gunshot	1	Incineration
Virginia	Fauquier 01	Backyard	90 (71)	CO_2 cart/container	1	Incineration

CO_2 – carbon dioxide
KED - Koechner Euthanizing Device (cervical dislocation)
TED – Turkey Euthanasia Device (captive bolt)
VSD+ - ventilation shutdown plus
*Number is total flock size prior to illness onset. Adjusted flock number (i.e., initial flock size minus birds that died prior to depopulation) is shown in parentheses.

Because HPAI outbreaks can result in large-scale depopulation of birds and carcass disposal, it is imperative to determine if USDA APHIS VS actions to address the current HPAI outbreak in the seven listed states would have a significant impact on the quality of the human environment under NEPA and its implementing regulations. USDA APHIS VS closely coordinates its HPAI response activities with States, Tribes, local governments, and impacted poultry producers/owners and the extent of the Agency's role depends on the needs of those entities and individuals for assistance in responding to an outbreak in any given location. However, the HPAI response actions USDA APHIS VS can take include any combination of continuing to monitor for the spread of HPAI in wild birds and domestic poultry, assisting in the control, depopulation, and carcass disposal of birds, which can range from loaning equipment to assisting directly in those actions, assisting in sanitizing affected premises, and providing support with monitoring, and guidance as to the appropriate time to release a premises from quarantine. At this point, USDA APHIS VS is working in affected states to curb the spread of HPAI. Thus, USDA APHIS VS actions are much like that of a fire department, which is on standby to respond if, when, and where a fire occurs, as needed; while fires are anticipated and they will be put out as necessary, the range in the number and destructive nature of fires is unknown. Without responding rapidly, an outbreak, much like a fire, could spread and subsequently cause much more widespread damage. This EA, in part, is preemptive much like the readiness of a fire department to respond to a fire, but it cannot predict with certainty if, when, and where an HPAI outbreak, may occur in domestic poultry.

The geographic scope for this EA is the states of Delaware, Indiana, Kentucky, Maine, Michigan, New York, and the Commonwealths of Virginia and Kentucky where USDA APHIS VS is working to stamp out HPAI at infected premises and could address further outbreaks within these States and Commonwealths.[4] While this may seem like a broad geographic scope, HPAI outbreaks are typically local, usually involving one or two farms, a county, or perhaps a few counties in these states. However, if HPAI outbreaks are not contained, HPAI can rapidly spread, and USDA APHIS VS needs to be prepared to assist in HPAI response activities anywhere in these states to which the outbreak may spread. Since February 24 and the writing of this EA, further outbreaks have occurred in five of the seven states and 32 additional states. NEPA documentation for states where new outbreaks have occurred will be covered in supplemental NEPA documentation USDA APHIS VS is currently preparing. The states affected by HPAI outbreaks that will be covered by the supplemental EA fall within all four migratory bird flyways (Atlantic, Mississippi, Central, and Pacific) and include the seven states examined in this Final EA.

As previously discussed, in HPAI outbreaks, USDA APHIS VS works with State partner agencies and the private sector to accomplish stamping out of an HPAI outbreak. USDA APHIS VS adheres to State and local regulations and encourages Best Management Practices for all involved (USDA APHIS (2022b). USDA APHIS VS follows *The Red Book* (USDA APHIS 2017e) when responding to an HPAI outbreak, including methods of depopulation and carcass management and generally States, Tribes, and producers/owners follow these guidelines.

[4] Kentucky and Virginia are Commonwealths. This EA will refer to them, hereinafter, as States for brevity since the terms are basically interchangeable.

1.3 Statutory and Regulatory Considerations

This EA was prepared consistent with the National Environmental Policy Act of 1969, NEPA's implementing regulations (40 CFR 1500-1508), and APHIS NEPA Implementing Procedures (7 CFR Part 372) for the purpose of evaluating how the proposed action may affect the quality of the human environment. APHIS NEPA Implementing Procedures (7 CFR 372.10) provide a process for rapid response to emergencies. Initially, the USDA APHIS Administrator or the delegated Agency official (APHIS VS Deputy Administrator) must determine that an emergency exists that requires immediate action before preparing and completing the usual NEPA review. USDA APHIS VS confirmed the detection of H5N1 (AI strain – see Appendix B) HPAI on February 8, 2022, on a poultry flock in Dubois County.

Due to the HPAI detection in Dubois County, the APHIS Administrator determined that an emergency existed and authorized USDA APHIS VS to take actions that are necessary to control the immediate impacts of the emergency and that are urgently needed to prevent imminent damage to public health or safety or prevent threats to valuable resources (7 CFR 372.10(a)). The U.S. poultry industry is the world's largest producer and second largest exporter of poultry meat and a major egg producer (USDA ERS 2022) with a value of $46.1 billion in 2021 (USDA NASS 2022). People also raise poultry in backyard flocks for fresh eggs, as pets, or to show at fairs and poultry shows. These birds are valued at fair market value according to indemnity rules and their associated tables. Because birds infected with HPAI become a source of disease to additional poultry and wild birds, it is USDA APHIS VS' objective to stamp out HPAI as rapidly as possible at locations where it has been found.

The process for rapid response to emergencies in 7 CFR 372.10 outlines separate processes for when the action at issue is normally analyzed in an EA (7 CFR 372.10(b)) versus an environmental impact statement (EIS) (7 CFR 372.10(c)). In this instance, USDA APHIS Environmental and Risk Assessment Services (ERAS) determined that an EA would be appropriate. HPAI outbreak response activities qualify as program plans that seek to adopt strategies, methods, and techniques as a means of dealing with animal health risks, in this case HPAI, that may arise in the future, which normally require an EA pursuant to 7 CFR 372.5(b)(1)(i). Additionally, an EA is warranted because the actions are more limited in scope (e.g., sites where an HPAI outbreak has occurred), any effects of HPAI outbreak response activities on environmental resources can be reasonably identified, and mitigation measures are generally available and have been successfully employed based on NEPA documentation for prior outbreaks (USDA APHIS 2017c), and an EA would likely be sufficient to cover actions that would need to be implemented to stop HPAI from spreading in states where outbreaks have occurred. For these reasons, the process in 7 CFR 372.10(b) is being followed.

Pursuant to 7 CFR 372.10(b), when the emergency action is normally analyzed in an EA, the Administrator or his designee will consult with the USDA APHIS Policy and Program Development Chief of ERAS about alternative arrangements for NEPA compliance. Such consultation was completed in this instance. The USDA APHIS Chief of ERAS can then authorize emergency alternative arrangements for completing the required NEPA compliance documentation,

which was also done in this instance. The USDA APHIS Chief of ERAS authorized emergency alternative arrangements because HPAI poses an immediate threat to human health and requires immediate response. If HPAI continues to spread throughout the United States, our country's natural resources, human health and safety, and food security could be threatened. In accordance with 7 CFR 372.10(b), the USDA APHIS Chief of ERAS provided the CEQ notice of the Agency's determination of NEPA emergency and alternative arrangements for compliance with NEPA via letter dated February 10, 2022, sent by e-mail (USDA APHIS 2022f). CEQ confirmed receipt of the notice on February 11, 2022.

Section 372.10(a) also requires that the Agency consider the probable environmental consequences of the emergency action and mitigate foreseeable effects to the extent practicable. USDA APHIS VS and ERAS considered the probable environmental consequences of the of HPAI outbreak response activities (USDA APHIS 2016a; 2016b; 2017c) and mitigated foreseeable environmental effects to the extent practicable under the local and prevailing circumstances. USDA APHIS VS consulted with state agency personnel and producers to determine the best course of action at each site given the on-site conditions and state and federal laws and regulations.

USDA APHIS VS safeguards American agriculture and ecosystems against the introduction of diseases into U.S. animal populations. The AHPA, 7 U.S.C. § 8301-8322, authorizes the Secretary of Agriculture (Secretary) to "carry out operations and measures to detect, control, or eradicate any pest or disease of livestock." 7 U.S.C. § 8308(a). HPAI is one such disease of livestock, specifically poultry. To carry out these disease mitigation operations, the AHPA further authorizes the Secretary to cooperate with other Federal agencies, States, or political subdivisions of States, and Tribal nations, among others (7 U.S.C. § 8310(a)). The Secretary has delegated the authority under the AHPA to USDA APHIS (7 CFR 2.80(a)(37)). Within APHIS, VS is responsible for providing direction and coordination for programs and activities under the AHPA (7 CFR 371.4(b)(xii)).

The AHPA recognizes the role of State and local authorities in addressing local outbreaks of animal-related diseases. While the Secretary may hold, seize, quarantine, treat, destroy, dispose of, or take other remedial action to animals, including poultry, that are moving or have been moved in interstate commerce, if the Secretary has reason to believe they may be affected by a disease of livestock (7 U.S.C. § 8306(a)(1)) and wishes to restrict intrastate movement of such animals, the Secretary must declare an extraordinary emergency (7 U.S.C. § 8306(b)(1)). The Secretary may only declare an extraordinary emergency upon a "*finding that measures being taken by the State are inadequate to control or eradicate the pest or disease*," and after review and consultation with the State (7 U.S.C. § 8306(b)(2)(A)). Based on these authorities, USDA APHIS VS in coordination with states, tribes, local authorities, and the poultry industry carries out disease mitigation operations to eradicate incursions and outbreaks of HPAI and works to prevent the establishment of HPAI in U.S. poultry.

USDA APHIS WS is authorized to implement disease surveillance and assist with reducing disease spread in wildlife under the Acts of March 2, 1931, as amended (7 U.S.C. § 8351-8352; 46 Stat. 1468-1469), and December 22, 1987 (7 U.S.C. § 8353; 101 Stat. 1329-1331). USDA APHIS WS conducts HPAI surveillance by collecting oral, nasal, cloacal, and fecal swabs from wild birds. This

is primarily done opportunistically by sampling hunter-harvested waterfowl and other migratory game birds at check stations where hunters stop, collecting and sampling vehicle-struck birds, or sampling birds taken during other wildlife damage management activities unrelated to a disease outbreak (e.g., a raptor is caught at an airport where it presents a strike risk for airplanes and is sampled before being relocated). USDA APHIS WS personnel also obtain samples from hand gathered dead or dying birds and mammals that are incapacitated due to some malady. Finally, direct sampling may occur by capturing wild birds with cage traps (e.g., swim-in cloverleaf traps) or rocket/cannon netting systems, typically in coordination with State agency personnel, swabbing orifices (cloaca, nostrils, and mouth), and releasing them. Samples are collected from waterfowl and other waterbirds that primarily migrate from regions where they intermingle with wild birds from Eurasia. Traps and rocket nets are only used in areas where threatened and endangered species are not present so they will not be accidentally captured.

USDA APHIS VS prepared this EA to comply with the provisions of NEPA, its implementing regulations at 40 CFR 1500-1508, USDA NEPA regulations (7 CFR 1b), and USDA APHIS Implementing Procedures (7 CFR part 372) for the purpose of evaluating the potential effects of the proposed HPAI emergency outbreak response activities on the quality of the human environment. The "*human environment*" comprehensively includes the natural and physical environment and the relationship of people with that environment (40 CFR 1508.1(m)). In general, the United States, as well as other countries, strive to prevent the introduction and establishment of HPAI to protect the health of their poultry populations and enhance their ability to export poultry and poultry products. USDA APHIS VS personnel abide by all applicable federal laws and associated state and local laws.

The proposed action examined in this EA consists of USDA APHIS VS emergency response activities, in coordination with states, tribes, local authorities, poultry owners, and the poultry industry, to poultry HPAI outbreaks in the states of Delaware, Indiana, Kentucky, Maine, Michigan, New York, and Virginia that began in February 2022. The need for this type of environmental documentation is supported by USDA APHIS NEPA Implementing Procedures, more specifically the regulation discussing the process for rapid response to emergencies (7 CFR 372.10). As previously discussed, USDA APHIS VS invoked this emergency response process, but as of February 24, 2022, state officials and private entities carried out most actions with technical assistance (discussion of available methods of depopulation, disposal, and disinfection) and some direct assistance with personnel and equipment (e.g., personnel trained in foaming and foaming units) from USDA APHIS VS to stamp out HPAI before it could spread from (or into) additional localities. The USDA APHIS VS role could change if more instances of HPAI are detected in these states and therefore, in compliance with 7 CFR 372.10(b), USDA APHIS VS is analyzing a reasonable range of alternatives in this EA for its anticipated continuing activities to satisfy NEPA. For this EA, USDA APHIS VS analyzed two alternatives that could adequately meet the need for action, specifically, the No Action Alternative and the Proposed Action (preferred) Alternative.

As described in Section 2.1.2, depopulation methods, disposal (carcass management), disinfection, and transportation are primary issues in emergency HPAI response activities. The depopulation methods and disposal methods of poultry carcasses at HPAI sites that have been used are listed in

Table 1 and are described in detail in Section 2.1.2. As noted in Table 1, a total of approximately 1.6 million poultry were depopulated at 15 sites in seven states prior to February 24. Since that date, approximately 470,000 additional poultry have been depopulated at 38 locations in 5 of these states. If the number of carcasses at any site exceeds 50 tons (100,000 pounds)[5], such an occurrence could potentially surpass a level that may significantly affect the human environment if not appropriately managed (USDA APHIS 2015a). If carcass biomass numbers exceed the 50-ton threshold and it is determined that potential environmental impacts could be significant, the appropriate level of NEPA documentation and considerations will be reassessed. USDA APHIS VS previously assessed the potential environmental effects associated with various carcass management alternatives that could be implemented during a mass animal health emergency (i.e., an event generating 50 tons of carcasses or more) in the programmatic EIS, Carcass Management During a Mass Animal Health Emergency. In instances where the 50-ton carcass threshold is exceeded at an affected premises for the current outbreak, USDA APHIS VS will consider the potential environmental effects, tiering to the analysis in the Carcass Management EIS (USDA APHIS 2015a).

NEPA analyses reflect the significance of the proposed action (40 CFR 1501.3), and emergency response decisions must be made in a timely manner to reduce or limit the range of potential effects. Significance definitions and criteria in 40 CFR 1500 – 1508[6] and 7 CFR 372.5(a) are used as the basis for Agency significance determinations. Effects on environmental resources have been reasonably identified, and the alternatives fully analyzed in this EA (Sections 2.1.1 and 2.1.2) and contain successful mitigation measures to minimize potential significant effects on the human environment (see Chapter 3).

By their nature, rapid responses to emergencies do not lend themselves to many public opportunities to influence Agency decision-making as part of the NEPA process. Nevertheless, consultation with and information provided by the public on depopulation, disposal, disinfection, and transportation options have been considered in several other NEPA documents (USDA APHIS 2016a; 2016b; 2017c; 2017e), which were consulted in preparing this EA, and have been discussed with state public officials, the poultry industry, and the public during their preparation. The success of actions taken to eliminate HPAI thus far, as well as public comments that may be received for this EA, will inform USDA APHIS VS on future actions, and give an indication of potential future mitigations that will be instigated to ensure that USDA APHIS VS' actions will have minimal potential to affect the human environment and improve HPAI outbreak responses.

[5] USDA APHIS considered a mass carcass management event for evaluation in its "Carcass Management During a Mass Animal Health Emergency Programmatic EIS" when a threshold criteria of 50 tons (100,000 pounds) of biomass was exceeded (USDA APHIS 2015a). This would equate to 20,000 5-pound broiler chickens or 4,000 25-pound turkeys at one location. However, it is possible to mitigate for different scenarios (e.g., carcasses/acre, compost height and cap (carbon source), and leachate and gas capture for lined burials) (USDA APHIS 2021).

[6] Significance definitions and criteria considered are consistent with 1978 and 2020 CEQ NEPA regulations.

1.4 Relationship of This EA to Other Environmental Documents

This EA is tiered to the Carcass Management EIS (USDA APHIS 2015a), which provides guidance for carcass disposal activities. This EA incorporates by reference the HPAI Eradication in Tennessee EA (USDA APHIS 2017c).

1.5 Issues Considered in this EA

USDA APHIS VS developed a list of topics for consideration in this EA based on prior activities such as USDA APHIS VS HPAI outbreak response activities in Tennessee (USDA APHIS 2017c), issues identified in public comments submitted for other similar EAs, the scientific literature on HPAI outbreak eradication efforts, and the use of depopulation and carcass management methods. Each major issue is evaluated under each alternative. The effects are discussed as defined in NEPA under 40 CFR 1508.1(g): "*Effects* or *impacts means changes to the human environment from the proposed action or alternatives that are reasonably foreseeable and have a reasonably close causal relationship to the proposed action or alternatives, including those effects that occur at the same time and place as the proposed action or alternatives and may include effects that are later in time or farther removed in distance from the proposed action or alternatives."* Effects may be projected where applicable.

The following topics were identified as relevant to the scope of the impacts analysis in this EA (USDA APHIS 2017c):

- Depopulation methods
- Carcass management – Disposal, cleaning and disinfection, transportation, and odor
- Risks to human health
- Risks to wildlife, especially birds of conservation concern, eagles, and threatened and endangered species
- Other potential environmental issues
    - Equity and environmental justice, children, and Tribes
    - Historic and cultural resources

USDA APHIS VS has limited ability to affect some concerns people have raised. For example, some individuals call for a decrease in the demand for dietary meat (Rust et al. 2020) while others believe that meat and meat product industries are part of everyday life (USPoultry 2017). Others do not care for certain poultry management practices such as high density and caged birds. Decreases in demand for poultry and poultry products as a result of issues such as these or other poultry management practices where USDA APHIS VS has little to no potential to change them do not impact HPAI outbreak response activities. Thus, these issues are outside the scope of this EA and will not be considered because these issues are pre-outbreak activities and as such any changes would only be useful prior to any outbreak occurring. Once an outbreak has occurred, the Agency's focus must be on efficiently and effectively responding to the outbreak.

1.6 Scoping and Public Involvement

On April 26, 2022, USDA APHIS VS announced on Regulations.gov (Docket ID APHIS-2022-0031) that it was making the "Emergency Response for Highly Pathogenic Avian Influenza Outbreaks in Seven States" draft EA and Finding of No Significant Impact (FONSI) available for public review and comment. USDA APHIS VS accepted written comments on the draft EA and FONSI for a period of 30 days, until midnight, May 31, 2022. At the end of the comment period USDA APHIS VS received a total of nine public comments. Of the nine comments, two were outside the scope of the EA. USDA APHIS evaluated the comments and, where appropriate, modified or added text in the EA. The USDA APHIS VS response to comments can be found in the associated FONSI for this EA. Comments received on the draft EA and FONSI are available for public review at www.regulations.gov, Docket ID: APHIS-2022-0031.[7]

[7] https://www.regulations.gov/docket/APHIS-2022-0031

2 Alternatives

This EA considers two alternatives in detail. Alternatives selected for detailed analysis include the No Action Alternative and the Proposed Action Alternative. Other alternatives were considered, but not analyzed in detail.

2.1 Alternatives Considered

In this EA, the No Action Alternative covers the baseline conditions for responding to HPAI outbreaks prior to any USDA APHIS VS HPAI emergency outbreak response actions taken in response to this current outbreak. CEQ's NEPA implementing regulations (40 CFR 1501.9(e)(2)) require the scope of analysis to include a no action alternative in comparison to other reasonable courses of action. Reasonable alternatives refer to those actions that are technically and economically feasible, meet the purpose and need of the proposed action, and where applicable, meet the goals of the Agency (40 CFR 1508.1(z)). The alternatives must safeguard the poultry industry and American public from HPAI, especially the potential for viral mutations associated with increased virulence and potential dissemination into human populations. This chapter also describes the alternatives that were considered, but not analyzed in detail in the environmental consequences section of the EA. The alternatives not analyzed were not chosen for detailed analysis because they are not technically or economically feasible or do not meet the management goal of surveillance and eradication of HPAI at poultry facilities in the affected states.

2.1.1 No Action Alternative

The No Action Alterative, a standard alternative analyzed under NEPA, is also the *status quo*. For the purpose of this EA, even though emergency actions have been taken, the status quo will be conditions that were occurring prior to the current HPAI outbreak. The No Action Alternative consists of the efforts currently being conducted throughout the United States, irrespective of whether there is an outbreak, for detecting HPAI and ensuring that it is stamped out.

Under this alternative, State agencies and private partners would be responsible for depopulating infected flocks, disposing of the carcasses, and completing cleanup and disinfection; technical guidance would be provided by USDA APHIS VS upon request by the State. Under the No Action Alternative, USDA APHIS VS would continue to conduct surveillance to monitor for HPAI, determine if outbreaks have occurred, and monitor sites where HPAI has been detected and eradicated (see Appendix B for surveillance activities of USDA APHIS VS). USDA APHIS VS would continue to provide these activities throughout the states covered by the EA. USDA APHIS VS would not be involved in depopulation, carcass management, clean-up, and disinfection at sites where HPAI is detected. USDA APHIS VS would monitor sites after depopulation and carcass management activities have been implemented in order to determine if HPAI has been eradicated. Otherwise, USDA APHIS VS would not provide any operational assistance with HPAI response actions.

USDA APHIS VS would provide indemnity payments for depopulated premises subject to regulatory requirements (9 CFR part 53). To be eligible for indemnity, the owner and, if applicable, the contractor, unless exempt under section 53.10(g)(2), must have a USDA-approved poultry biosecurity plan (9 CFR 53.11) (USDA APHIS 2022d). Under the AHPA (7 U.S.C. 8301 et seq.), USDA APHIS VS can make indemnity payments of up to 100 percent of the fair market value for live birds and eggs that must be destroyed as a result of HPAI. Further, the AHPA also authorizes USDA APHIS VS to compensate certain costs associated with cleanup, disinfection, and disposal of birds and materials, such as eggs, bedding, and litter, as necessary, to eliminate the virus (USDA APHIS 2017e).

When HPAI is detected, typically State or Tribal officials immediately issue a quarantine, hold order, or standstill notice and restrict movement of poultry and poultry products for infected premises based on the authority and regulations of the affected state. USDA APHIS VS may issue a federal quarantine when requested by a State Animal Health Official or as directed by the Secretary of Agriculture, but federal quarantines are not typically issued in HPAI outbreaks. This action is based on statutes and regulations of the affected state, but varies by state (USDA APHIS 2017e; 2022d). An Incident Command is set up to ensure all personnel responding to an outbreak are working in unison so that resources are used efficiently (ISU 2022). Thus far in this HPAI outbreak, State officials have issued the quarantine, hold order, or standstill notice and restricted movement of poultry for the infected premises based on the authority of the affected state.

Within the unified Incident Command, the Incident Commander works with the Operations Section (unit responsible for executing tactical activities) and Situation Unit (unit responsible for collecting, processing, and organizing the incident information) to determine zone, area, and premises designations during an HPAI outbreak. These designations are captured in the Emergency Management Response System 2.0 (USDA APHIS 2017e). Under the No Action Alternative, USDA APHIS VS would monitor the location and provide recommendations to the impacted states as to whether it is appropriate to lift the quarantine when the premises meets the state's criteria for release of quarantine and movement control (USDA APHIS 2017e). The State agencies, poultry owners, and contractors would be responsible for depopulation, disposal, disinfection and clean-up, and any associated transportation of carcasses and infected material to an off-site disposal facility.

2.1.2 Proposed Action (Preferred) Alternative

Under the Proposed Action Alternative, USDA APHIS VS personnel would conduct all activities as outlined under the No Action Alternative and, upon request from the State, assist with depopulations, carcass management, and clean-up and disinfection of premises with HPAI. USDA APHIS VS personnel will work alongside and in close coordination with State and local government partners and poultry owners to complete these actions. The level of assistance USDA APHIS VS provides depends on the needs of the impacted state. This is the Preferred Alternative, which USDA APHIS VS has been implementing on an emergency basis pursuant to 7 CFR 372.10 at infected premises and which USDA APHIS VS would continue to implement if this alternative is selected.

Under the Proposed Action Alternative, trained USDA APHIS personnel from several programs in the Agency, including VS (lead program for HPAI outbreaks at farms) and WS (lead program for wild bird surveillance) act as first responders in addition to providing federal oversight for HPAI emergency response activities. A joint Incident Command structure with both state and federal resources, as described under Alternative 1, would be expanded in response to the emergency to provide additional needed human resources, equipment, and supplies. USDA APHIS bears these costs. Providing a rigorous federal response incentivizes the rapid reporting of disease incidence because it achieves disease eradication while providing relief to the owner/operator who may lack the resources to deal with the emergency outbreak in a timely manner. Under this alternative, animal suffering is minimized, and an owner/operator can resume business as rapidly as possible.

2.1.2.1 Depopulation

Federal law gives USDA APHIS VS authority to destroy, dispose of, or take any other remedial action with respect to any animal that is moving or has been moved in interstate commerce and may have been affected with or exposed to a disease of livestock at the time of movement (7 U.S.C. 8306(a)(1)). Pursuant to statutory and regulatory authority, (7 U.S.C. 8310(a); 9 CFR 53.4), USDA APHIS VS is authorized to cooperate with other Federal, State, local, and Tribal Authorities in the control and eradication of HPAI. This includes the authority to depopulate flocks affected by HPAI in order to contain or stop the spread of disease.

Depopulation is defined as the destruction of many animals in response to an animal health emergency (USDA APHIS 2016d). Depopulation is not used under ordinary circumstances and applied only during times of emergency. AI-infected birds shed large quantities of virus, particularly in their feces and respiratory secretions (USDA APHIS 2022b). Delays in depopulation can result in an exponential increase in the total amount of HPAI virus shed into the environment by infected poultry, thus showing the importance of rapid depopulation to control and contain an outbreak (USDA APHIS 2022b).

For an HPAI outbreak, speed is of utmost importance to limit the spread of the disease and the pain and suffering of new birds becoming infected. The use of a particular method will not impact indemnity payments if the method has been identified by the American Veterinary Medical Association (AVMA) (AVMA 2019) as a preferred method or a method permitted in constrained circumstances. In HPAI outbreaks, the choice of using a particular depopulation method depends on availability at the site, the time necessary to get the best method to the facility, flock size and density, the type of operation (indoor/outdoor), personnel risks, and cost. Considerations must be timely and limit 1) the spread of the disease, 2) the pain and suffering of both infected animals and of new animals becoming infected, and 3) contact between humans (personnel) and poultry to limit any zoonotic risk. The method(s) selected must consider animal welfare to the extent practicable (USDA APHIS 2013; 2017e). For example, production systems requiring live birds to be hand captured may cause stress and result in pain from injuries in the process of catching or handling poultry (Alphin et al. 2010). However, to resolve the problem in a timely manner, some stress may be inevitable such as hand capturing birds to depopulate.

State and Federal Animal Health Officials discuss recommended depopulation methods (AVMA 2019) with the owner of the birds, who then chooses the method, which in indicated in a request for indemnity. The state animal health official and poultry owner are the decision-makers regarding depopulation methods used with recommendations from USDA APHIS VS. The State Animal Health Official and USDA APHIS VS give recommendations for a depopulation method based on human safety, animal welfare considerations, poultry housing type, environmental conditions, available resources and personnel, and cost effectiveness. The owner of the birds carries out depopulation activities, if possible, or requests assistance from the State or USDA APHIS VS.

Under the Proposed Action Alternative, USDA APHIS VS would coordinate with state authorities and owners to conduct and assist with depopulation of poultry at HPAI-infected premises, as needed. Emergency activities, thus far, have involved the use of several depopulation methods including water-based foam, carbon dioxide (CO_2) carts, ventilation shutdown plus (VSD+) heat, cervical dislocation, gunshot, and injectable euthanasia agents (Table 1). Most of these actions were taken by state partners or the poultry owners, but USDA APHIS VS provided support with services and materials, including contracting foamers, sources for water or foam concentrate, and other equipment, as needed. If USDA APHIS VS is involved, personnel follow all state and federal regulations for depopulating (USDA APHIS 2022e). Based on previous HPAI outbreak responses and AVMA recommendations (AVMA 2019), the paragraphs that follow describe the potentially available depopulation methods that may be utilized during the HPAI outbreak. All the methods listed below have not been used to date and may not necessarily be approved for use in all of the seven states covered in this EA.

Water-Based Foam

The water-based foam depopulation method is a preferred method for large indoor poultry barns with floor-housed birds and is adaptable to large-scale disease eradication efforts (Alphin et al. 2010; USDA APHIS 2015a). Foam depopulation uses medium- or high-expansion foam generation equipment to create a blanket of water-based foam over the top of the birds. Immersion in the foam causes rapid occlusion of the airway or asphyxiation, resulting in hypoxia[8] and a rapid death (AVMA 2019). Experience with foaming machines is key to quickly resolving problems such as malfunctions and using the appropriate amount of foam (e.g., too much water from foam slows in-house composting). USDA APHIS VS uses CO_2 or Class A fire-suppression foam (Phos-Chek® WD881 or Silv-Ex Plus® Class A Foam Concentrate) to depopulate birds. Other formulations are available that have not been used. The Class A fire-suppression foams utilized by USDA APHIS VS do not contain perfluoroalkyl and polyfluoroalkyl substances, and perfluorooctane sulfate.[9]

[8] The technical term is mechanical hypoxia. The foam forms a mechanical barrier to oxygen delivery to the airway. The animal dies because the blood oxygen level drops due to hypoxia. Asphyxiation is the state of being deprived of oxygen.

[9] Perfluoroalkyl and polyfluoroalkyl substances (PFAS), which include perfluorooctane sulfate (PFOS), are man-made chemicals that have been used in a wide array of consumer, commercial, and industrial products, including some fire-fighting foams. These chemicals are found throughout the environment where they break

The use of compressed air foam is identified by the AVMA as a depopulation method that may be permitted in constrained circumstances on cage-housed poultry ((AVMA 2019). Compressed air foam may be infused with CO_2 or nitrogen. However, according to AVMA, compressed air foam is not yet available for field use (AVMA 2019).

Homeland Security Presidential Directive 9 established the National Veterinary Stockpile in 2004 to protect the nation's food supply by maintaining enough countermeasures capable of deployment against the most damaging animal diseases within 24 hours. Countermeasures available include supplies, equipment, vaccines, and response support services. The National Veterinary Stockpile has access to a variety of depopulation equipment including foamers and trained contractors available through USDA contracts (USDA APHIS 2019a).

Carbon Dioxide (CO_2) and Other Approved Gasses

Various gases or gas mixtures have been used for depopulation of poultry including carbon monoxide (CO), hydrogen cyanide, and CO_2. CO_2 has been used widely in containerized and whole-house methods for depopulating poultry flocks (AVMA 2019). In situations where it is possible to maintain gas concentrations at a high level, inert gases such as nitrogen or argon, or a mixture of them with 20% to 30% CO_2 can be used. CO is lethal at low concentrations and requires a smaller supply than other gases, but at high concentrations is explosive and its lethality can make it unsafe for people. Hydrogen cyanide is also lethal to humans, requiring increased safety measures. Thus, CO and hydrogen cyanide are generally not suitable for depopulation except in limited circumstances. At sufficient but a wide range of concentrations, CO_2 will kill poultry by hypercapnic hypoxia. CO_2 can be used for partial- or whole-house gassing including older houses that are difficult to seal. CO_2 can be detected by poultry, specifically chickens, at concentrations of 40% to 50% causing aversion from discomfort (McKeegan et al. 2005), but such aversion was overcome by a food reward at concentrations of 60% or greater (Webster and Fletcher 2004; Sandilands et al. 2011). Inert gases, such as nitrogen and argon, are not detected by poultry and do not elicit direct aversive responses.

CO_2 is a colorless, odorless gas that is an accepted depopulation method per AVMA (AVMA 2019). The advantages of using CO_2 are: 1) its well established rapid depressant, analgesic, and anesthetic effects, 2) its ready availability (e.g., can be purchased in compressed gas cylinders), 3) its broad safety margin (e.g., poses minimal hazard to personnel when used with properly designed equipment), and 4) its negligible bioaccumulation potential. Inhalation of CO_2 causes little distress to the birds, suppresses nervous activity, and induces death within 5 minutes. In addition, inhalation of CO_2 at a concentration of 7.5% increases the pain threshold, and higher concentrations of CO_2 have a rapid anesthetic effect (AVMA 2019). CO_2 can be transported in liquid form, allowing large effective volumes to be delivered to a depopulation site. The National Veterinary Stockpile, which

down very slowly. Scientific studies have shown that exposure to some PFAS in the environment may be linked to harmful health effects in human and animals (for more information see PFAS Explained | US EPA).

is overseen by USDA APHIS VS, has access to a variety of depopulation equipment, including CO_2 carts.

Chambers that quickly fill with gases, like CO_2 from a compressed gas cylinder or bottle, are sometimes used for smaller operations. These are attached via a hose to a chamber that automatically floods the chamber. CO_2 and CO are heavier and fill from the bottom of the chamber up, but rapidly will mix with oxygen when introduced (from the top down). For the most part, the gas is undetectable and causes unconsciousness and death relatively quickly and humanely when administered. Commercial sources for the chambers are generally more reliable and these can be mounted on trailers so they can be mobile, and USDA APHIS VS labels them as CO_2 carts. Safeguards are taken to protect personnel using the equipment including training on use, ensuring more than one person present, going outdoors where possible to use CO_2, knowing the location of the gas sources and emission vents, alarm signals, and any special precautions for working in poultry barns.

To rely solely on gas treatments is often not practical because it would exhaust limited resources during an outbreak by creating sudden demands for those supplies (AVMA 2019). Even so, CO_2 is a preferred method for depopulation of poultry, especially for cage-housed birds.

Ventilation Shutdown Plus (VSD+)

The 2019 AVMA Guidelines for Depopulation of Animals provides that VSD using heat or CO_2 (VSD+) is permitted in constrained circumstances for floor-reared, confined poultry, including aviary style housing, and caged-housed poultry (AVMA 2019). VSD+ involves shutting off any air circulation into the poultry house, closing inlets, and turning off fans with the additional use of CO_2 or an increase in the heat within the houses with the goal of achieving 100 percent mortality in as short of a time as possible (AVMA 2019; USDA APHIS 2022e). AVMA (2019) does not recommend VSD alone as a depopulation method for poultry, except as a last resort. Many variables including age, size, insulation, and ventilation system of a barn, the ability to seal off air leaks, and the number of birds make it difficult to raise temperatures enough within a structure using VSD alone to achieve 100 percent mortality within the desired timeframe.

The need to depopulate an infected flock quickly may sometimes require the use of VSD+. USDA APHIS VS has developed a policy as to when use of VSD+ may be warranted (USDA APHIS 2022e). VSD+ has been used during the current outbreak because it provides relatively quick depopulation and requires fewer resources and personnel (USDA APHIS 2022e). Decisions are handled on a premises-by-premises basis, with close coordination and collaboration by state and USDA APHIS VS officials. The poultry owner ultimately chooses the method used, but USDA APHIS VS can concur with the use of VSD+ in constrained circumstances. USDA APHIS VS will not concur in the use of VSD+ unless the following six requirements are met:

1. Other methods are not available or will not be available in a timely manner.
2. The amplification of the virus on the premises poses a significant threat for further transmission and ongoing spread of HPAI.

3. The questions about the VSD+ policy document have been reviewed and discussed by USDA APHIS officials, State or Tribal officials, and the incident management team.
4. Incident management team approval.
5. State official approval.
6. National Incident Coordinator approval (USDA APHIS 2022e).

USDA APHIS VS (USDA APHIS 2022e) notes the use of CO_2 in depopulation provides additional health and safety considerations for responders performing field operations. In the event VSD+ is used alone without CO_2, USDA APHIS VS recommends adding heat to achieve a minimum temperature of 104 degrees Fahrenheit (°F) to 110°F as quickly as possible and preferably within 30 minutes, for a minimum of three hours (USDA APHIS 2022e). Whenever VSD+ is used in constrained circumstances, USDA APHIS VS also has the AVMA goal of achieving 100% mortality rate in as short of time as possible. USDA APHIS VS has assisted with implementing these methods with state personnel and poultry owners during the current outbreak.

Cervical Dislocation

Cervical dislocation may be used to euthanize birds that are hand gathered or captured in live traps. The AVMA recommends cervical dislocation, when properly executed, as a humane technique for euthanasia and depopulation of poultry and other small birds (AVMA 2019). Cervical dislocation rapidly induces unconsciousness, does not chemically contaminate the tissue (i.e., the use of euthanasia drugs such as sodium phenobarbital may cause secondary toxicity hazards from scavengers feeding on carcasses), and is easily accomplished by personnel trained in the technique (AVMA 2019). The Koechner Euthanizing Device (KED) (e.g., KED-S (scissors, birds to 4 pounds (lbs.)), KED-C (chicken, to 12 lbs.), and KED-T (turkey, to 65 lbs.)) is the device primarily used to accomplish cervical dislocation. Funnels that allow only the head and neck to be slid into view are often used with a KED to control the bird and present the neck, ensuring that cervical dislocation can be done efficiently and humanely. USDA APHIS VS trains field personnel, veterinary medical officers, and animal health technicians on the use of KED devices during depopulation and disposal coordinator training (USDA APHIS 2022h).

Decapitation

Completely severing the neck causes rapid unconsciousness from a severed nervous system and a lack of blood flow to the brain. This can be done cleanly with an axe, sharp knife, or scissors. A clean cut through the vertebrate, rather than a crushing cut, is most humane and quickest. A disadvantage of the method is the risk to biosecurity due to a release of body fluids. The AVMA indicates that decapitation as a depopulation method is warranted under constrained circumstances (AVMA 2019) that may include, but are not limited to, zoonotic disease risk, human safety, depopulation efficiency, deployable resources, equipment, animal access, disruption of infrastructure, and disease transmission risk.

Captive Bolt

Captive bolts are made by a variety of companies, but essentially eject a solid bolt plunger from a device to cause blunt force trauma to the brain with or without penetrating the bird's skull (PIC 2016). The bird is held firmly on the ground or hard surface and the captive bolt gun held over the midline on the topside of the head (behind the comb) between the eye and ear. Typically, compressed CO_2 air fires the bolt out a certain length depending on if it is a blunt or a penetrating bolt. Euthanasia comes from causing extensive brain damage, hemorrhage, and rapid brain stem death and is very effective (Jacobs et al. 2021). Several penetrative and non-penetrative captive bolt devices are commercially available. For example, the Turkey Euthanasia Device (TED) is a non-penetrative captive bold device that can be used on chickens and turkeys within a specific weight range. The AVMA (2019) depopulation guidelines list captive bolt as a preferred depopulation method for all types of poultry operations (e.g., floor-reared confined, cage-housed, and outdoor-access poultry).

Gunshot

The AVMA guidelines consider gunshot an accepted depopulation method that is permitted under constrained circumstances. This method may be acceptable when dealing with a small number of feral or wild backyard flocks that cannot be easily caught or moved or large birds or ratites (i.e., larger, flightless birds). When applied properly, this method can quickly result in unconsciousness and a humane death (AVMA 2019). USDA APHIS personnel, primarily from WS, that are certified to use firearms, may use the method to take poultry that cannot be caught by other means. Risk was found to be minimal when used by certified USDA APHIS WS personnel (USDA APHIS 2019b).

Firearms are also used to depopulate wild birds found in the vicinity of poultry barns so that they do not spread HPAI. Typical birds in and around eastern poultry barns include several invasive species, such as European starlings (*Sturnus vulgaris*), house sparrows (*Passer domesticus*), feral rock pigeons (*Columba livia*), Eurasian collared doves (*Streptopeila dedaocto*), and house finches (*Haemorhous mexicanus*), and native species, such as mourning doves (*Zenaida macroura*), red-winged blackbirds (*Agelaius phoeniceus*), and common grackles (Quiscalus quiscalus). The number of birds taken at a poultry barn typically are few, but a little more are taken around backyard flocks where birds have access to the feed. The few birds removed for biosecurity reasons would not have an effect on their populations, especially considering most are invasive species.

Injectable Euthanasia Agents

The use of injectable agents, which involves the administration of an anesthetic or barbiturate, is an AVMA recommended depopulation method that was utilized on a number of backyard flocks. Many USDA APHIS personnel and private people, such as veterinarians, are certified to use approved injectable euthanasia agents. Injectable euthanasia agents are typically used for small numbers of animals such as backyard flocks. Injectable euthanasia agents used include sodium pentobarbital (e.g., Beuthanasia®-D, Sleepaway®, Fatal-Plus® Solution) and potassium chloride. Sodium pentobarbital is a barbiturate that rapidly depresses the central nervous system to the point

of respiratory arrest (USDA APHIS 2001). Intravenous injection is the most rapid and reliable technique for administering sodium pentobarbital. Intraperitoneal injection may be used when it would cause less distress than intravenous injection (AVMA 2013). Potassium chloride is a salt that can cause cardiac arrest when administered intravenously in solution (340 grams in 1 liter of water). Approximately 120 milliliters of potassium chloride is injected into the target animal (Shearer and Ramirez 2013). Policies for use of injectable euthanasia agents by USDA APHIS personnel comply with the Drug Enforcement Agency and the Food and Drug Administration regulations, in addition to compliance with requirements of the states where personnel use these drugs.

2.1.2.2 Carcass Management

Individual carcass management actions occur within poultry facility boundaries (onsite composting, burial, and incineration), or at off-site locations (after transport to off-site landfills, incinerators, or renderers) (USDA APHIS 2015a). Early depopulation efforts (before there is widespread disease) minimize the volume of carcasses for disposal, which reduces the potential for significant environmental effects (USDA APHIS 2017e). Due to the low body weight of poultry (in comparison to cattle or swine), few sites are expected to have the volume of carcasses in the affected environment rise to the level where disposals may result in significant environmental effects. That is, poultry disposals during this emergency are not expected to reach 50 tons of carcasses except for large poultry facilities (~20,000 5 pound chickens or 4,000 25-pound turkeys) (USDA APHIS 2015a).

Death losses or mortalities create a need for poultry carcass disposal (Blake et al. 2008). As carcasses begin to degrade, bodily fluids, chemical and biological leachate components, agricultural dust, and potentially harmful gases are released. Biological leachate is the liquid that results from decomposition of biomass (USDA APHIS 2015a). Carcass management seeks to reduce or avoid environmental effects from leachate and these other products. On-site carcass management options reduce the risk of spreading pathogens during transportation and include grinding followed by composting indoors or outdoors, above ground or on-site burial, mobile incineration, and open burning. Open burning releases products like ash that can affect air quality, consequently, state and local laws may restrict the use of this method. Off-site options typically include composting at a centralized location, fixed site incineration, rendering, and burial in a sanitary landfill.

An additional concern during carcass management is not only carcass cleanup, but also disposal of eggs, and potentially infected litter and other material. The disposal of carcasses and infected materials and disinfection of affected premises or surfaces could result in potential impacts on the physical environment if they are not handled properly (USDA APHIS 2011; 2013; 2017e). When following guidelines to manage carcasses and other materials following depopulation (USDA APHIS 2014c; 2016c; 2017e), carcass management activities pose mitigated risks to the human environment. USDA APHIS VS examined how mass mortality risks would be addressed in the Carcass Management EIS (USDA APHIS 2015a). As described in the Carcass Management EIS, standard operating procedures and mitigation measures are available to ensure that carcass management has no effect on the environment, even when 50 tons of carcasses are exceeded.

In those states where emergency HPAI responses have occurred, USDA APHIS VS worked with state officials on a unified response to evaluate timely and local carcass disposal options available appropriate for each premises. USDA APHIS VS assists State agency personnel and poultry owners, for example, by finding carbon sources for composting, providing or finding contractors that have fixed site or mobile incinerators, what landfills are in the area and whether they take hazardous waste or not, and what heavy equipment operator businesses are available for constructing approved burial pits. Disposal methods used thus far at the sites identified in Table 1 for this HPAI outbreak have included indoor and outdoor composting (mostly on-site), burial, incineration, and landfill disposal. Best management practices were used during carcass management to minimize risks to the public, responders, farm workers, and poultry producers, which varies by method as discussed in detail below. The primary concern is that the HPAI virus is killed and does not infect additional birds; for example, the HPAI virus can survive in wetlands for several months where a lot of waterfowl are found indicating the need for proper carcass management with minimal leachates that could get into water sources (Ramey et al. 2020). Disposal methods that may be available to manage carcasses in Delaware, Indiana, Kentucky, Maine, Michigan, New York, and Virginia are discussed below. Not all methods listed may be available for use in all seven states.

Composting

Under proper conditions, composting eliminates HPAI H5N1 (Ahmed et al. 2012). In-house composting is a preferred carcass-disposal method for HPAI, especially if an outbreak leads to depopulation under largely intensive conditions, because marketing and movement of poultry are controlled, the disease is localized, and the risk of reinfection is low (Alphin et al. 2010).

When compost piles are properly constructed inside poultry facilities, leachate contamination of areas outside the poultry barns and houses does not occur. Outdoors, a properly selected composting site seeks to minimize potential human health impacts, in part, by reducing surface water runoff, movement of leachate, and migration of composted nutrients into ground water (Mukhtar et al. 2004; Berge et al. 2009). Properly constructed piles include at least a 1-foot-thick base layer of carbonaceous material, like wood chips, that absorbs liquids and prevents leachate migration. Properly constructed piles also include at least a 1-foot-thick cover of carbon material, which minimizes release of gasses and odors and prevents access by insects and scavengers. Proper q, facilitating air movement within the pile, and increasing the activity of aerobic microorganisms (Keaten and Hutchinson 2017). USDA APHIS VS, and generally state officials and industry, use this method, where appropriate, because it minimizes the potential for further exposures.

Burial

Carcasses can be buried in “lined” and “unlined” pits, typically dug with a backhoe on-site. Dependent on the number of carcasses to be buried, the pit may be required to be lined (engineered) to prevent seepage of leachate from decomposing carcasses into the soil and ground water and the release of methane (CH_4). Carcass burial trenches and pits are lined with materials underneath, such as synthetic liners or compacted clay liner systems, which can reduce groundwater contamination

significantly by impeding leachate from moving through the soil (Chowdhury et al. 2019). Unlined burial, especially for a small number of carcasses (state regulations determine the number of carcasses and size of the pit for that volume) may occur on a premises only with the permission of the owner/operator and by meeting state and local requirements. States typically set a maximum weight for carcasses, minimum depth and distance to waterbodies and residences, maximum slope, and minimum distance above water table, requirements consistent with state environmental regulations. To meet the local distance requirements, state responders determine the soil types, slope, and drainage patterns in the affected environment and, with the producer, determine a location for such a site. Many localities do not allow unlined burials because public health impacts could potentially arise, such as exposure to pathogens or chemicals released into the environment during decomposition. Proper site selection and burial procedures can minimize and slow the spread of pathogens and reduce human exposure, although pathogens can persist in an anaerobic environment (Nutsch and Spire 2004). Unlined burial releases high concentrations of ammonia, organic acids, and gases (e.g., CO_2 or CH_4) (Nutsch and Spire 2004) that can be toxic to humans. This is not a common carcass disposal choice, except possibly for small backyard flocks, because it often requires state environment authority approval as well. USDA APHIS VS will secure a contractor and pay for this disposal method if the state and producer determine it is appropriate.

Landfill

The U.S. Environmental Protection Agency (USEPA) regulates non-hazardous waste landfills under Subtitle D of the Resource Conservation and Recovery Act (RCRA) in coordination with state and local agencies. Disposal of carcasses in a certified solid waste landfill (USEPA 2021b) allows for the safe and efficient disposal of large quantities of carcasses.[10] Disposal at landfills is advantageous due to their large capacities and widespread distribution throughout the country. However, individual landfill managers may put restrictions on the type or quantity of materials they accept. The landfill will also control the frequency of deliveries. Technical requirements and procedures for landfilling of HPAI wastes are established by the state-level regulatory agency responsible for permitting of landfills (state environmental agency). The state environmental agency informs federal/state agencies charged with protecting animal health, biosecurity, and disease control of the landfill facilities deemed technically able and willing to accept HPAI wastes for disposal.

Depending on local environmental conditions, AI virus particles, though, can remain infectious in landfill conditions for a variety of durations, but typically up to a month (Graiver et al. 2009; Ramey et al. 2020). Proper design and long-term management of the landfill minimizes human health risks from landfill disposal of animal carcasses. Design features include liners at the bottom of the landfill, cover materials (such as soil and vegetation) at the top of the landfill, and gas control systems (which collects and removes gases). These measures reduce the likelihood of uncontrolled

[10] Solid waste landfills must meet stringent design, operation, and closure requirements under Subtitle D of RCRA. These landfills are excavated or engineered sites where non-liquid waste is deposited for final disposal and covered. The units are designed to minimize the chance of release of any leachate or gases into the environment.

leachate and/or gases moving into the environment and potentially affecting the human water supply.

Rendering

Carcass rendering converts raw animal tissues into various fat, protein, and mineral products. Rendering uses pressurized steam at varying degrees and times such as 239°F to 309°F for 40 to 90 minutes in continuous- or batch-flow units to inactivate bacteria, viruses, protozoa, and parasites while making a variety of products (National Renderers Association 2006). Rendering is sufficient to inactivate AI viruses and can be used for poultry carcasses if a rendering plant is nearby. This method has been used, but rarely. These are typically commercial facilities that USDA APHIS VS personnel are not trained to use. USDA APHIS VS has not used this method, during the current outbreak, but could.

Incineration

Incineration is a waste treatment process that involves the combustion of substances contained in waste materials. Industrial plants for waste incineration are commonly referred to as waste-to-energy facilities. Incineration and other high-temperature waste treatment systems are described as "thermal treatment." Incineration of waste materials converts the waste into ash, flue gas, and heat. The ash is mostly formed by the inorganic constituents of the waste and may take the form of solid lumps or particulates carried by the flue gas. The flue gases must be cleaned of gaseous and particulate pollutants before they are dispersed into the atmosphere.

Incineration is used to burn carcasses to ash with an auxiliary fuel source, such as propane. Due to the cost of the auxiliary fuel necessary to burn carcasses, it may not be an economically viable alternative. Incinerators can be fixed or mobile (small incinerators on trucks). Due to their small capacity, incinerators are usually not used for large quantities of carcasses but are considered an efficient disposal method for smaller numbers of poultry. Incineration of carcasses at a fixed-facility incinerator is a highly controlled process designed to minimize human health risks from air emissions. Waste-to-energy incinerators have been used on a pilot-scale and could likely be used in the future. These municipal solid waste facilities have been considered for large-scale carcass disposal, but have not yet been used for the purpose of poultry carcasses. Newer models emit much less particulates and leachate. Mobile incinerators, typically much smaller, are used on-site and can process a small number of carcasses.

Ash, collected in receptacles in the bottom of most incinerators, is disposed of at landfills or other controlled facilities designed to minimize human health risks and. New models are generally biosecure and minimize the loss of ash and leachate. Incineration can be associated with human health risks from inhalation of air emissions and ash disposal, but these are typically minimal unless older models are employed. Incineration is sufficient to inactivate viruses and has been used in HPAI disposal of smaller numbers of carcasses. USDA APHIS VS recommends the use of incinerators, especially for smaller numbers of poultry such as a backyard flock.

Open Air Burning

Open air burning is where carcasses are scattered over wood or other flammable material, doused with a flammable liquid, and set on fire. Due to required permits, which are not available in many locations (generally from a county or state fire marshal), this has rarely been used. USDA APHIS VS has not generally used this method for poultry, except in limited situations for small numbers of birds, i.e., small backyard flocks, but it is mentioned to ensure it is distinguished from incineration.

Alkaline Hydrolysis

Alkaline hydrolysis uses an aqueous solution of an alkaline chemical, such as caustic potash, lye, or a highly basic (pH) soap, and water heated and sometimes put under pressure to speed up decomposition of carcasses. The highly basic solution liquifies carcasses over several days. When carcasses are liquified, an acidic compound, such as manure, is then added to reduce the alkalinity. The remaining biomass, hydrolysate, can be used for biogas production (Arias et al. 2018). The benefits of ambient alkaline hydrolysis include no uncontrolled emission of gases, nutrients, or pathogens into the environment. Traditionally, costs of alkaline hydrolysis equipment and its movement, along with the need for neutralization of the highly caustic hydrolysate are drawbacks to use. Nevertheless, ambient alkaline hydrolysis followed by silage neutralization and anaerobic digestion can solubilize broiler carcasses within 20 days (Arias et al. 2018). This process allows poultry producers to maintain materials on-site in the event of a mass mortality event and they can increase the number of containers to the scale needed. This method has not been used by USDA APHIS VS or poultry owners mainly because it is usually a small batch process that takes time. It is becoming more common as a disposal method and may be used in the future, but primarily for small numbers of carcasses.

Anaerobic Biodigester

An anaerobic biodigester uses anaerobic microbes to naturally breakdown organic matter (e.g., carcasses, plants, manure, sewage sludge) in the absence of oxygen. -The process is similar to composting except that the gases are captured and can be used for power. Biodigesters are large, closed vessels that are built for anaerobic digestion to take place. Temperatures range from 86ºF to 100ºF for mesophilic digesters (intermediate temperature environment) and 122ºF to 140ºF for thermophilic digesters (high temperature environment) and generally have particular microorganisms that thrive in these temperature ranges (USEPA 2021c). Thermophilic digesters are generally used to destroy most pathogens (USDA APHIS 2012).

Carcasses are ground then placed in a digester and decomposed by various fermentative (anaerobic) bacteria (USEPA 2021a). For example, in lactic acid fermentation, ground carcasses are mixed in tanks with lactic acid bacteria and fermentable carbohydrates such as whey or corn. Biogas is generated, mostly CH_4 and carbon dioxide, with small amounts of water vapor and other gases. Carbon dioxide and other gases can be removed, leaving only CH_4. In addition, digestate, a wet mixture that is usually separated into solid and a liquid, is left. Recovering CH_4 from biogas can be a cost-effective source of renewable energy. Digestate is nutrient rich and can be used as fertilizers

for crops if temperatures are consistently high enough to deactivate HPAI. Otherwise, digestate can be stored in vented vats and transported to a rendering facility (USEPA 2021a). Odors are emitted during the process and can be reduced by storing digested carcass materials in sealed and controlled-vented containers (USDA APHIS 2012). Anaerobic digestion can sometimes be slow, approximately 7 to 10 days, to complete. The capacity for digestion is sometimes limited and the method is not often appropriate for the disposal of large quantities of carcasses. While some States have used anaerobic digestion during an HPAI outbreak, it is generally only practical at this point for small-scale backyard flocks.

2.1.2.3 Transportation

During an HPAI outbreak, most poultry carcasses are disposed of on-site, requiring minimal transportation, which reduces the need for biosecurity measures such as a cleaning station for vehicles (USDA APHIS 2022d). However, carcass disposal may not be feasible on all sites and therefore, a certain amount of off-site carcass transport may be necessary as a precursor to disposal. Animal health officials work to ensure the movement does not spread a disease and is safe for decontamination personnel, transport operators, landfill, incinerator, and rendering workers, and the public. To reduce the potential for impacts, all necessary biosecurity steps outlined in the Poultry Industry Manual (USDA APHIS 2013) are followed. It may be challenging to clean and disinfect items after contact with diseased poultry and litter. Depopulated poultry carcasses may be transported off-premises in sealed containers lined with heavy-duty plastic zip bags that are sealed, covered with a tarp, and disinfected prior to transport and USDA APHIS VS may assist in finding contractors to take these to a landfill, renderer, or other off-site disposal area (Slingluff et al. 2014).

The agricultural and food sectors are among the largest users of freight transportation because products are transported from farm gates to storage or processing facilities before shipment to urban centers (DeCara et al. 2017). In 2015, transport of meat, poultry, fish and seafood products traveled 43.8×10^9 ton-miles, with the average distance being 184 miles, primarily by rail and water (DeCara et al. 2017). The U.S. Department of Transportation and USEPA regulate interstate truck transport, with only a limited role for the USDA to regulate animal transportation for animal health.

USDA protects animal health during transportation through regulations that generally prohibit interstate movement of diseased animals (9 CFR 71.3) or those comingled with dead animals (9 CFR 71.17) or garbage (9 CFR 166.8), and by requiring the final carrier to clean and disinfect conveyances before reuse (9 CFR 71.5, 71.6). Vehicle owners are responsible for cleaning and disinfecting, which is done without expense to the USDA (9 CFR 166.14). USDA APHIS representatives can inspect and stop the interstate movement of infected or disease exposed animals (9 CFR 71.13). Other than these types of justifiable requirements to protect animal health, USDA cannot restrict the time, place, or manner of interstate movement, which includes the emission efficiency of conveyances.

2.1.2.4 Cleaning and Disinfection

HPAI has a high survival rate on both organic and inorganic materials, and therefore, aggressive cleaning and disinfection practices are required for both ongoing biosecurity measures to contain the HPAI virus to infected premises and to eliminate the virus from contaminated equipment, materials, and other fomites (objects or materials that carry infectious agents, such as vehicle tires, equipment, and shoes).Cleaning is the removal of gross contamination, organic material, and debris from the premises. Cleaning can be mechanical, like sweeping (dry cleaning) or the use of water and a soap or detergent (wet cleaning). Disinfection refers to the methods that are used on surfaces to destroy or eliminate microorganisms such as viruses and bacteria. HPAI virus disinfection can be physical (e.g., heat) or chemical (e.g., disinfectants). Cleaning and disinfection activities focus on eliminating the HPAI virus in the most cost-effective manner possible.

Chemical disinfectants assist in protecting animal health by inactivating microbes on hard nonporous surfaces that cause disease in animals. Over 200 products are registered by USEPA for use in disinfecting premises for HPAI (USDA APHIS 2022c; USEPA 2022a). The selection of a specific product and use by a producer would likely follow a conversation involving state and federal personnel. Users must carefully follow label directions for the products available (e.g., ammonium, hydrogen peroxide, iodine, and chlorinated products) including the contact time (the time necessary to kill the HPAI virus on a given surface) to safely handle and use the products and avoid harm to human health and the environment. USDA APHIS VS assists poultry producers with sources for cleaning and disinfection products but is not responsible for conducting these activities. A poultry producer's biosecurity plan (e.g., (ISU 2022; USDA APHIS 2022d)) usually has the steps necessary for cleaning and disinfection. State officials and USDA APHIS VS ensure that the premises are HPAI free through monitoring (testing for HPAI) before a site can be declared HPAI free and a quarantine is lifted.

2.2 Alternatives Considered but Not Analyzed in Detail in the EA

A few alternatives were considered but not analyzed further because these would not meet the need for action.

2.2.1 No Federal Action Alternative

Under the No Federal Action Alternative, USDA APHIS VS would not conduct HPAI stamp out operations and HPAI outbreak responses would solely be left up to State agencies, tribes, and producers to resolve as outbreaks occurred. State agencies or private entities would likely conduct HPAI eradications as needed and as funding allows but would do so without federal assistance or guidance. If HPAI gets a foothold in a state that was unable to eradicate it quickly or completely on its own, HPAI may become endemic in the United States. Such an outcome could impact the U.S. poultry industry and trade such as being unable to sell poultry products to trade partner countries because a fear would exist that HPAI could spread to their country. This alternative would be counter to the AHPA (7 U.S.C. 8301-8317) whereby Congress articulated that disease outbreaks

would be controlled through interdiction, research, and eradication and be administered by the Secretary of Agriculture because of environmental and resource concerns. Thus, this is not a viable alternative to meet the need for action and USDA APHIS VS would be unable to fulfill its mission.

2.2.2 Nonlethal Only Alternative

HPAI is an emerging disease threat that threatens poultry and wild birds, which could have impacts to the human environment without coordinated intervention. A common alternative often requested is a Nonlethal Only Alternative. Currently, there is no HPAI vaccine approved for use in the United States. APHIS must carefully consider the potential trade and disease control consequences of vaccination use before approving an HPAI vaccine for domestic use. Vaccine use could interfere with our ability to detect the disease quickly before the virus spreads, and this limited detection ability could lead to trading partners restricting their imports of U.S. poultry and poultry products, even when we are not experiencing an outbreak. Poultry populations need to be depopulated and carcasses disposed of to effectively eliminate further transmission of this disease. The nonlethal only alternative would not meet the purpose and need of the proposed action at this time.

2.2.3 Specific Depopulation and Disposal Methods Not Used Alternative

State partners and poultry producers have the ultimate responsibility for selecting the method(s) of depopulation and disposal that will be used at a particular location. For example, many states do not allow open air burning or unlined burial of carcasses, so these methods cannot be chosen. Although USDA APHIS VS discusses depopulation and disposal methods with state partners and poultry producers/owners and makes recommendations as to the methods to employ at a certain site, USDA APHIS VS does not provide formal approval of the method(s) chosen. At most, USDA APHIS VS may concur with the method(s) chosen by the state partners and poultry producers/owners. However, USDA APHIS VS considers the method(s) chosen by the state partners and the poultry producers when evaluating whether the poultry producers are eligible from indemnity payments pursuant to the regulations in 9 CFR Part 53. Because USDA APHIS VS has little control over the method used, this alternative is similar to the proposed action, which is analyzed in detail, and thus does not warrant analysis as a separate alternative.

3 Potential Environmental Consequences

This chapter of the EA summarizes the affected environment and potential effects that may occur to human health and the environment under the No Action and the Preferred Alternatives. This chapter discusses the existing conditions, or the environmental baseline, which is a summary of the current human and biological resources in Delaware, Indiana, Kentucky, Maine, Michigan, New York, and Virginia. Each identified major issue will be evaluated under each alternative and the direct and indirect impacts will be discussed for each as well as cumulative impacts.

This section on potential environmental effects broadly considers many types of potential effects. Often, the number of animals in an area or the intensity of the agricultural efforts determines the potential for environmental effects. Due to the low body weight of poultry (in comparison to cattle or swine), the volume of carcasses at a given location is unlikely to rise to the level where disposals may result in significant environmental effects. That is, even in the aggregate, rapid poultry disposals at a site reduce the likelihood of reaching the 50-ton (100,000-pound) threshold for an emergency carcass management situation that may result in significant impacts (USDA APHIS 2015a).

3.1 Scope of the Analysis

3.1.1 Evaluation of the Potential Impacts of Agency Action

An impact is any change, beneficial or adverse, from existing (baseline) conditions described for the affected environment. Thus, impacts mean changes to the human environment, including human health and ecological resources, that could result from HPAI emergency response operations and the eradication of HPAI from specific premises within the seven states that are the focus of this EA. Pursuant to CEQ regulations (40 CFR 1508.1(g)), "*impacts or effects considered are those that are reasonably foreseeable and have a reasonably close causal relationship to the action of the alternative being considered*." Impacts may occur soon after the action or occur later in time.

Potential impacts include ecological, such as the effects on natural resources and the components and functioning of affected ecosystems, historic, aesthetic, cultural, social, or effects on public health. Effects may include those resulting from actions that may have both beneficial and detrimental effects, even if on balance the Agency believes that the effect will be beneficial (40 CFR 1508.1(g)). In considering whether the effects of the proposed action are significant, agencies analyze the potentially affected environment, and the degree of the effects of the action in relation to the affected environment (40 CFR 1501.3(b)). Agencies must also consider connected actions consistent with 40 CFR 1501.9(e)(1). The potentially affected environment is defined by the area(s) potentially impacted by the proposed action (e.g., national, regional, or local), and associated resources (e.g., natural, cultural). In considering the degree of the effects, agencies are to consider the following, as appropriate, in relation to the proposed action:

- Short and long-term effects,
- Beneficial and adverse effects,
- Effects on public health and safety, and
- Effects that would violate federal, State, Tribal, or local laws protecting the environment (40 CFR 1501.3(b)(2).

USDA APHIS VS focused its analysis of potential effects on the poultry industry, the effectiveness of methods used to depopulate affected flocks, manage carcasses, transport carcasses, minimize odors, and clean and disinfect premises, risks to human health and wildlife, and other potential issues as discussed in Section 1.5.

3.1.2 Affected Environment

In its NEPA implementing regulations, CEQ defines "affected environment" as the environment of the area(s) to be affected or created by the alternatives under consideration (40 CFR 1502.15). The affected environment section of this EA describes the physical and social conditions of the geographic areas where impacts may occur from USDA APHIS VS proposed HPAI emergency response activities. To make an informed decision about which actions to take, it is necessary for a federal agency to understand who and what may be affected.

As of February 24, 2022, HPAI was confirmed in wild birds in states that lie along the Mississippi and Atlantic Flyways (these bird migration corridors are discussed in Appendix B in further detail). Since that date, HPAI has been detected in wild birds in all four North American flyways. Additional detections in these flyways will be discussed in a supplemental NEPA document currently being prepared by USDA APHIS VS. At the time of the writing of the draft EA, HPAI emergency responses had taken place in seven U.S. states: Delaware, Indiana, Kentucky, Maine, Michigan, New York, and Virginia. The program area for two outbreaks included surveillance in surrounding counties in Tennessee and Maryland; however, these counties in Tennessee and Maryland are not considered in this document because HPAI was not detected in either state as of February 24, 2022. States where new outbreaks have occurred during this HPAI outbreak, which includes Maryland, will be discussed in a supplemental NEPA document being prepared by USDA APHIS VS.

HPAI emergency response activities within each state include establishing a control area centered on confirmed HPAI detection sites, 6.2-mile (10-kilometer (km)) radius (USDA APHIS 2013). Areas within these seven states that may be potentially impacted by emergency response operations are assumed to occur within the 10-km control zone surrounding an infected premises. USDA APHIS VS response under both the No Action Alternative and Proposed Action Alternative would operate in additional locations within these states, as necessary, to cover new premises infected with HPAI.

HPAI-infected, and potentially infected, flocks could be depopulated in commercial production facilities, at farms, and in "backyard" premises (i.e., where birds are raised on private premises for the sole use of the owner). Program authorities (USDA APHIS VS and state officials) could determine, in coordination with the impacted poultry producer, that moving the carcasses to a

landfill for disposal is the best available disposal option; this would involve transport over local roads. USDA APHIS VS and State officials would evaluate disposal options based on the size of the flock, local conditions, and applicable laws/regulations (USDA APHIS 2015c).

Although the probability of human cases of HPAI is low (CDC 2022b), certain types of locations might experience enhanced surveillance. A 2015 study identified geographical and demographic factors associated with higher risk of human H5N1 infection in China: density of live poultry present, density of human population, amount of built-up land, relative humidity and precipitation, forest coverage, and amount of water bodies present (Li et al. 2015). Zoos, aviaries, recreational parks, pet shops, breeding facilities, labs, and other locations with vulnerable bird populations may be closed to the public as a preventive measure (Cohen 2022; DeMarco 2022) or until an HPAI quarantine is lifted. A dwindling supply of healthy birds may affect businesses that sell local fowl as food and processing facilities that handle local poultry parts.

For additional information about the proposed program area, see Appendices B and C at the end of this document.

3.1.3 Resources (Issues) Not Evaluated in This Analysis or Not Analyzed in Detail

The following resources or issues described in this section are not expected to be affected by the alternatives analyzed or there is no difference in potential impacts between the two alternatives. These resources will not be analyzed further.

3.1.3.1 Poultry Production and Practices

A concern often raised is that the poultry industry contributes wastes and other pollutants, such as from transportation, into the environment. Poultry production processes are described in the Poultry Industry Manual (USDA APHIS 2013) and indicate areas of concern for poultry producers. For most of the animal's life, litter and gaseous emissions from poultry are removed from the immediate environment or dispersed, so that they have, at most, minimal environmental impacts. However, potential environmental impacts can be associated with improperly managed wastes that do not meet industry standards for poultry operations. For example, a poultry or slaughtering facility that allows wastes to build up can have environmental impacts from release of gases and leachate associated with wastes. For the most part, though, environmental impacts occurring as part of ongoing poultry production facilities, primarily from the improper disposal of wastes as well as transportation, are beyond USDA APHIS VS authority to regulate, especially under the AHPA. USDA APHIS VS does not have the regulatory authority to alter the federal or state permitting processes that minimize waste release and control air emissions.

Another concern often voiced is that poultry should be raised in cage-free and low-density environments. The raising of poultry is not regulated under the AHPA (7 U.S.C. 8301 et seq.) or the Animal Welfare Act (7 U.S.C. § 2131, *et seq*). This means that the choice of whether to raise poultry with or without cages and at low to high density are business decisions not subject to USDA

APHIS control under these Acts. Many poultry producers voluntarily participate in the National Poultry Improvement Plan (NPIP), a collaboration between state and federal officials, in order to demonstrate that the producers adhere to principles that limit disease spread, including HPAI (USDA APHIS 2020c). The NPIP addresses flock plans, biosecurity standards, compliance agreements and more. Because USDA APHIS VS has limited authority to regulate the conditions for raising poultry and this HPAI outbreak has already started, any changes to poultry production practices are unlikely to impact how the current outbreak is handled.

Poultry production practices can be addressed in the NPIP (USDA APHIS 2020c). The NPIP program standards are periodically updated per 9 CFR 147.51. The NPIP biosecurity principles list recommendations on training, establishment of a line of separation, perimeter buffer areas, personal protective equipment (PPE) needed for personnel, preventing poultry from having contact with wild birds, rodents, and insects, procedures for use, cleaning, and disinfection of equipment, mortality disposal, manure and litter management, replacement poultry, water supplies, feed and replacement litter, reporting of elevated morbidity and mortality, and auditing. However, any changes to poultry production practices would have to be done prior to an outbreak occurring and would be implemented too late to have any effect on current HPAI emergency outbreak response activities.

A notable finding considered in this EA, discussed in Section 3.2.4 - Risks to Wildlife, is that birds raised outdoors are much more likely to encounter wild birds carrying HPAI than poultry raised indoors (Bouwstra et al. 2017; Bergervoet et al. 2019; Schreuder et al. 2020; Elbers and Gonzales 2021). Thus, outdoor flocks have a higher potential to contract HPAI.

3.1.3.2 Land Use and Infrastructure

Land use patterns, such as whether a farm is used to produce poultry, and infrastructure, such as the barns used to raise poultry, would remain the same under both alternatives and be unaffected by HPAI emergency outbreak response activities. USDA APHIS VS does not have the authority to mandate poultry housing, including density, number, location, or type of housing. Therefore, these issues will not be considered further.

3.1.3.3 Air Quality

The Clean Air Act (42 U.S.C. §§ 7401 et seq.) is the primary Federal law that protects the nation's air quality for the purposes of public health and welfare. The Clean Air Act requires USEPA to establish National Ambient Air Quality Standards (NAAQS) for specific pollutants. These pollutants are known as criteria pollutants, and include ozone, particulate matter, CO, nitrogen dioxide, sulfur dioxide (SO_2), and lead. The standards are intended to represent the maximum concentration of a specific pollutant in the ambient air that will not adversely impact public health or welfare. USEPA will classify areas as in compliance (attainment) or not in compliance (nonattainment) with NAAQS. Per the Clean Air Act, States must develop plans to attain and maintain NAAQS in all areas of the country and a specific plan to attain the standards for each area designated nonattainment. The stringency of air pollution regulations in a specific area is based upon whether that area is in attainment (e.g., compliance) or nonattainment (e.g., not in compliance) with standards.

Potential air impacts associated with outbreak responses may result from emissions from vehicles, including heavy equipment (e.g., tractors, backhoes, dump trucks), and depopulation and disposal methods (e.g., foamers, CO_2 carts/chambers, incinerators, compost piles), and disinfection products. However, effects from these emissions are expected to be low in volume, temporary in duration, localized, and highly likely to dissipate below detectable levels. The process of depopulation and off-site disposal of a backyard flock generally can be completed in one day. Typically, heavy machinery is not required, as birds are handled individually, and then transported off-site for disposal at an incinerator or landfill. When onsite composting of backyard flocks is used, the process takes longer because decomposition can take up to two months, depending on compost pile conditions. However, although machinery may be used to create and turn these smaller piles, they would only be used briefly several times during the duration of the composting process.

The majority of backyard producers chose to use an extended fallow period instead of disinfection; so, as a result, no air emissions would have been released as part of that process. The choice to use a particular disinfectant (e.g., ammonium, hydrogen peroxide, iodine, and chlorinated products) by a producer would likely follow a conversation involving state and federal personnel. Impacts to air quality are not expected from the use of disinfection products when label directions to safely handle and use the product are followed.

A number of the larger backyard flocks and the vast majority of commercial premises chose to dispose of poultry carcasses by indoor and outdoor composting. As described for the backyard flocks, although the composting process may take up to two months, during the majority of that time decomposition is occurring and the piles are undisturbed. While equipment, such as a loader or digger, may be needed to create and turn the piles, emissions would be short-term and would have minimal impacts on air quality.

Commercial premises (shown in Table 1) that exceeded the 50-ton carcass threshold[11] all utilized indoor or outdoor composting to dispose of depopulated birds. Some of the larger backyard premises also chose composting as their disposal method. Composting has been successfully and safely used in past HPAI responses, as well as for carcass management during natural disasters and other disease outbreaks. In the 2014–2015 U.S. HPAI outbreak, disposal by composting was utilized for 85 percent of the poultry carcasses (USEPA 2022b). As discussed in the Carcass Management EIS (USDA APHIS 2015a), composting can potentially result in the release of carbon dioxide, ammonia, CH_4, and other volatile organic compounds. Emissions of any volatiles, such as ammonia, are sufficiently diluted in outdoor environments and when vented from buildings are of limited to no environmental risk. If composting (including land application of composted material) is done according to site-specific soil characteristics and guidance from Federal and State agencies, emissions are expected to be minimal.

[11] The 50-ton threshold was used in the Carcass Management EIS to define a mass animal health emergency and equates to approximately 20,000 5-pound broiler chickens or 4,000 25-pound turkeys.

As a result, HPAI emergency outbreak response activities are not expected to have any impact on the air quality in an area, besides those from short-term, transient emissions on each premises. Impacts to air quality are expected to be similar under both alternatives because these activities will occur regardless of whether USDA APHIS VS is involved or not in onsite response activities.

Under the No Action Alternative, it may be possible that without USDA APHIS VS direct assistance, response activities may be delayed, and further outbreaks could occur as a result. In those instances, air pollutant emissions from the use of equipment, depopulation and disposal, and clean-up and disinfection would occur at new outbreak locations. However, we believe that air pollutant emissions from HPAI stamp out activities at any additional outbreak sites would be minimal and transient and not impact air quality with relatively few birds.

3.1.3.4 Water Quality

The Clean Water Act (33 U.S.C. §§ 1251 et seq.) establishes the basic structure for regulating discharges of pollutants into the waters of the United States and regulates quality standards for surface waters. It is the primary federal law that protects the nation's water quality for the purposes of public health and welfare. Sources of water contamination may include soil erosion, leaching, surface water runoff, and groundwater contamination.

The Class A fire suppression water-based foam used to depopulate poultry houses dissipates quickly and has no known documented impacts on water quality when used in this manner. Depopulation using CO_2 involves venting the CO_2 to the atmosphere with no impact on water quality. The VSD+ process also has no impact on water quality.

Under both alternatives, the leachate from decaying carcasses and disinfectants from disinfection activities may potentially impact water quality. The decomposition of large volumes of poultry carcasses can create excessive amounts of leachate and other pollutants (Gerber et al. n.d) that, without any mitigation measures, may migrate into surface or groundwater. In general, the potential for impacts to water quality rises as the number of carcasses increases. As a result, the improper disposal of poultry carcasses may impact the quality of surface and ground water resources.

Unlined burial may contribute to the release of contaminants into impacted waters, or impairment of otherwise healthy water bodies. Because unlined burial raises environmental concerns, it is only used in areas or circumstances where environmental impacts are expected to be minimal, such as the burial of a few carcasses. Ensuring soils are not highly permeable and the water table is not within 2 feet of the bottom of the burial pit minimizes the likelihood of significant environmental impacts to surface and groundwater (USDA APHIS 2017b).

As noted in the previous section, commercial premises with HPAI outbreaks (shown in Table 1) that exceeded the 50-ton carcass threshold all utilized indoor or outdoor composting to dispose of depopulated birds. Composting indoors within a structure can provide protection of the compost pile against bad weather, such as heavy rainstorms, and minimize the potential runoff of leachate into surface water or groundwater. Properly identifying an outdoor site for composting will

minimize any potential impacts to water resources. During site selection, applicable state or local regulations, such as grading permits, sediment and erosion controls, and/or environmental approvals, should be considered. USDA APHIS guidance (USDA APHIS 2017a) for evaluating sites for outdoor composting recommends the following site factors that are protective of surface water and groundwater:

- Contain on-site soil depths or be modified, such as create a thicker base layer, to achieve at least 24-inches to seasonal high-water tables;
- Contain on-site soil depths in excess of 36 inches to bedrock;
- Not be located on a flood plain;
- Have (or construct) diversion ditches, terraces, or berms to direct surface water flows and storm water away from active compost piles.
- Meet state-specific setback requirements, which should be no less than:
    - 200-feet from a water supply well used for drinking;
    - 200-feet from water bodies, including: ponds, lakes, streams, rivers;
    - 200-feet from a nearby residence (not owned by the premises);
    - 50-feet from a drainage swale that leads to a water body; and
    - 25-feet from a drainage swale that does not lead to a water body.

A properly constructed compost pile would include a sufficiently thick base layer of porous carbonaceous material, such as wood chips, to absorb excess moisture and minimize the potential migration of leachate from the compost to the soil and groundwater (USDA APHIS 2015a). If excess leachate is a concern, an impermeable pad of a low-permeability soil base, pavement, or a suitable liner material may be placed beneath the compost pile (USDA APHIS nd). USDA APHIS VS maintains a roster of emergency mortality composting subject matter experts who have met specific training/experience standards and are available upon request to provide on-site composting guidance during an HPAI outbreak.

The disinfectants used for HPAI disinfection are registered for specific use with USEPA and used according to label requirements. Label instructions for a disinfectant are provided for its proper application to prevent potential environmental impacts associated with the use of the registered product. Overall, we believe impacts on water quality will be minimal, if any, at sites with HPAI outbreaks under both alternatives because there are standard protocols such as those from NPIP (USDA APHIS 2020c) that are followed.

Emergency HPAI outbreak response activities will occur under both alternatives, the main difference being the level of involvement of USDA APHIS VS. USDA APHIS VS guidance and increased involvement in carcass management during outbreaks may minimize issues such as impacts to water quality because of the Agency's expertise in handling outbreaks. However, because the states, localities, and tribes often successfully employ the outbreak response activities with varying levels of assistance from USDA APHIS VS, we do not anticipate the impacts to water quality to be appreciably different based on who is engaging in the outbreak response activities.

3.1.3.5 Soils

HPAI response activities performed by USDA APHIS VS and others (e.g., States, Tribes, local authorities, owners, operators) are expected to have minimal impact on soils (USDA APHIS 2015a). Carcass management and disposal (USDA APHIS 2015a) will be conducted regardless of the alternative. Unlined burial or open-air burning of carcasses would be the method most likely to impact soil because the byproducts of these methods are not contained and have a greater chance of migrating to nearby soils. Onsite unlined burial and open-air burning would contribute to chemical and physical impacts to the soil, primarily in the immediate area where unlined burial or open-air burning occurs. However, these disposal methods may not be allowed in all locations. State and local regulations may not allow burial of carcasses based on soil type or how close groundwater or surface water is located.

Large commercial facilities in the first seven states impacted by HPAI during this outbreak chose to dispose of carcasses by indoor and outdoor composting (see Table 1). Indoor composting provides a controlled environment and is not expected to directly impact soil quality. The proper siting and construction of outdoor compost piles minimizes any impacts to soil from leachate created during the carcass decomposition process. As discussed under section 3.1.3.4, Water Quality, a compost pile with a sufficiently thick base layer of porous carbonaceous material would absorb excess moisture and minimize the migration of leachate from the compost to the soil (USDA APHIS 2015a). Additionally, an impermeable layer of a low-permeability soil base, pavement, or a suitable liner material may be placed beneath the compost pile (USDA APHIS nd). The changes to soil quality may be beneficial by providing nutrients and minerals that would increase crop yield and plant growth; however, excess nutrients in the soil may also be harmful to plants. Additionally, nutrients found in compost applied to the soil surface may be susceptible to moving off-site as runoff, so compost should be applied appropriately.

Soil would be impacted from digging trenches, removing topsoil, and compacting from the use of heavy equipment. Due to the fact that that primarily nutrients will be released into the soil, the impacts to soils are expected to be minor, but similar under each alternative (USDA APHIS 2015a).

HPAI outbreak responses activities will occur under both alternatives with the main difference being the level of involvement of USDA APHIS VS. Response activities by USDA APHIS VS and others should have minor effect on soils.

3.1.3.6 Climate Change

Federal agencies comply with Executive Orders 13990 (“Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis”) and 14008 (“Tackling the Climate Crisis at Home and Abroad”) by considering the effects of climate change on a proposed action, the potential effects of a proposed action on climate change, and potential mitigation measures that could be applied to the proposed action.

Direct climate change effects on poultry include extreme weather events, impacts to the poultry industry such as heat stress to birds, drought reducing the ability to adequately provide water for routine maintenance, and flooding of premises. Increased effect of heat stress on poultry is a direct effect of climate change. Reducing heat stress conditions may indirectly reduce susceptibility to diseases. Extreme precipitation and soil erosion coupled with overall drought increase the risk of exposure to heat events. Heat events can reduce productivity, which indirectly influences the availability of poultry feed. These effects elevate risks to U.S. agricultural and natural resources.

Examples of impacts of climate change to HPAI emergency response activities include extreme weather events that may interfere with responder movements during depopulation and carcass management. Drought could reduce the types of carcass management and sanitization methods that could potentially be used. For example, burning in all forms could be banned if there is a potential for wildfire to result. Use of water-based foaming and some disinfection methods that require a great deal of water may not be used where strict water restrictions are in place.

The response activities associated with an HPAI outbreak could increase emissions of greenhouses gases, namely CO_2, CH_4, nitrogen oxides (NOx), sulfur dioxide (SO_2), and ammonia (NH_3) (USDA APHIS 2015a). The primary gases emitted would be CO_2 and CH_4 for burial and nitrogen dioxide (NO_2) and SO_2 for open air burning, but much less for incineration (USDA APHIS 2014c). Use of heavy equipment, vehicles, incinerators, foamers, and other equipment that burn fossil fuels emit greenhouse gases. Carcass management methods such as burial and composting release gases as carcasses decompose. The slower the decomposition, the more gases that could be produced. These would be the same or similar under both alternatives, unless a state could not complete an HPAI stamp out project that resulted in additional outbreaks. Any increase in greenhouse gas emissions would likely be minor.

USDA APHIS VS does not generally recommend methods that would increase emissions such as open burning, but depending on state regulations, the state officials and poultry owners may use such methods because they ultimately determine the methods that will be used. USDA APHIS VS may suggest mixing and grinding carcasses, carbon sources, and debris to increase the rapidity of decomposition (Keaten and Hutchinson 2017), which could result in less emissions due to the reduced time to decompose. Again, USDA APHIS VS does not select the depopulation or disposal methods utilized. Under both alternatives, the choice of methods used is expected to be the same since state and Tribal officials with the poultry owners determine which methods are ultimately used. Therefore, emissions will be similar or the same under both alternatives.

3.2 Resources (Issues) Evaluated in This Analysis

The AHPA (7 U.S.C. § 8301-8322) provides USDA APHIS VS with the authority to deal with disease outbreaks as they occur, and to promote animal health. When disease outbreaks occur, USDA APHIS VS coordinates with appropriate state entities, tribes, and local authorities, as applicable, to take measures that effectively stamp out the spread of disease. Effective management of both infected poultry, litter, and eggs is necessary to minimize the spread of disease while

protecting human health and the environment. USDA APHIS VS uses the term "litter" to refer to a mixture of poultry excreta, spilled feed, and bedding. Measures to stop disease spread currently range from disease monitoring and surveillance; quarantine and movement controls; depopulating affected flocks; disposing of the carcasses, litter, and eggs; and cleaning and disinfecting facilities and equipment. Under the No Action Alternative, USDA APHIS VS would focus on disease monitoring and surveillance and providing recommendations and technical assistance with respect to all other aspects of an HPAI outbreak. Under the Preferred Alternative, USDA APHIS VS would conduct all activities as outlined under the No Action Alternative and would work alongside and in close coordination with State and local government partners and poultry owners to assist, as needed, with depopulations, carcass management, transportation, clean-up, and disinfection of premises with HPAI.

Potential effects to the physical environment include effects to soil, water, and air from depopulation, carcass management, transportation, odor considerations, and clean-up and disinfection of premises (including equipment used).

3.2.1 Depopulation Methods

3.2.1.1 Baseline Condition

USDA APHIS VS takes an integrated approach to depopulation, recommending and using a combination of methods to achieve its goal to quickly stamp out HPAI (USDA APHIS 2015a). Depopulation methods available in the seven states covered in this EA (some used and some with future potential for use) on HPAI-infected birds were described in Chapter 2 and primarily include asphyxiation with foam or CO_2, VSD+, cervical dislocation, decapitation, captive bolts, gunshot, and injectable euthanasia agents. Upon request from a State agency, USDA APHIS VS can provide the personnel and resources needed to help complete depopulation in a timely manner. As part of the National Veterinary Stockpile, USDA APHIS VS has access to various types of depopulation equipment that are often on standby in many areas of the country or can contract out the work to companies with the needed equipment. The type of flock (i.e., commercial or backyard), the poultry production method, and the availability of equipment and resources at a specific location all influence the decisions about the depopulation methods used to achieve the 24- to 48-hour goal for depopulation.

As of February 24, 2022, state partner agencies and poultry owners in coordination with USDA APHIS VS, depopulated approximately 1.6 million poultry in seven states (Table 1). Since that date and the publication of the draft EA, an additional 470,000 poultry have been depopulated in five of the seven states evaluated in the draft EA. The methods State authorities and poultry producers/owners selected for depopulation have been whole-house and cart/container CO_2 gassing, water-based foaming, cervical dislocation, captive bolt, and VSD+ for commercial poultry barns, and cart/container CO_2 gassing, cervical dislocation, gunshot, and injectable euthanasia agents for backyard poultry. Four commercial premises used VSD+ (VSD plus heat) in combination with other methods to depopulate onsite flocks (see Table 1). As described in Section 2.1.2.1, USDA APHIS VS maintains that VSD+ should only be utilized in constrained circumstances that meet

specific criteria stipulated by the AVMA (AVMA 2019). The facilities that utilized VSD+ had large numbers of birds on the premises and needed to utilize more than one depopulation method in order to complete HPAI stamp out activities in a timely manner. Some of the reasons that VSD+ had to be utilized included: inability of foamers to be quickly mobilized, water was not available for foaming, foaming could not be used due to the size and structure of the bird housing, or the large volume of CO_2 required could not be obtained promptly. Where large numbers of birds are involved, it is more humane to depopulate quickly than let birds continue to shed virus, infecting other birds, and die slowly from the disease, which can cause hemorrhaging and other maladies that may be painful.

3.2.1.2 Potential Impacts: No Action Alternative

Under the No Action Alternative, the poultry owner and the state would determine the method of depopulation. Upon request from a state official or poultry owner, USDA APHIS VS could provide technical guidance on depopulation methods that would be effective given the current on-site conditions and characteristics, but USDA APHIS VS would not help with implementation. If the poultry owner submits an indemnity request, depopulation must be conducted according to AVMA (2019) guidelines. Additionally, either state or USDA APHIS VS personnel must be on-site to ensure that depopulation is completed and done correctly. States and industry will likely continue to perform depopulation without operational federal assistance in situations where they have sufficient resources. If the state or poultry producers do not have the resources to properly manage an outbreak, it is possible that HPAI could spread further without quick and efficient depopulation of infected poultry. With respect to environmental impacts, a concern is whether the 24- to 48-hour goal for depopulation can be met without operational federal assistance. Thus far, all depopulations for the affected premises have been carried out, but the goal to meet the 48-hour depopulation has not always occurred. The larger poultry facilities may struggle to meet this goal due to the sheer volume of poultry that need to be depopulated. The overall goal is to depopulate as quickly as possible because poultry are shedding virus while they are alive and HPAI can cause several painful conditions, including hemorrhaging and neurologic conditions.

3.2.1.3 Potential Impacts: Proposed Action Alternative

Under this alternative, USDA APHIS VS would provide technical guidance with depopulation methods as under the No Action Alternative, but it would additionally assist the State, Tribes, and owners with implementation of depopulation methods, if requested. USDA APHIS VS would consider and may approve requests for indemnity from poultry producers/owners. Upon request, USDA APHIS VS could mobilize equipment, supplies, and USDA APHIS VS personnel and contractors to assist with depopulation activities. Additionally, as under the No Action Alternative, USDA APHIS VS or State animal health officials would observe the depopulation to ensure it is carried out according to AVMA (2019) guidelines. It is expected that under the Proposed Action Alternative, USDA APHIS VS personnel, upon request from the State or Tribes, will be involved in depopulation activities in the seven states should additional outbreaks occur.

USDA APHIS VS personnel, in coordination with State officials and poultry operation personnel and owners, would use the most humane method available given the on-site conditions, the type of flock (backyard or commercial), location, and the availability of resources (people with expertise and methods), following USDA APHIS (2017e) guidance. Under constrained circumstances identified by AVMA (2019), VSD+ may be used. The same depopulation methods are available for use under both alternatives and the primary issue is the humaneness of the methods and who is implementing them. AVMA (2019) concluded that these methods can be used humanely during mass depopulation of poultry, but some methods, such as VSD+, are only recommended for use in limited circumstances. A difference that could occur is that USDA APHIS VS personnel that use these methods undergo national training to use them efficiently and effectively, which may allow for HPAI to be stamped out faster. While most states and producers can use these same methods, they may not have the same level of training that USDA APHIS VS gives employees.

3.2.2 Carcass Management – Disposal, Disinfection, Transportation, and Odor

3.2.2.1 Baseline Condition

Carcass management, transportation, and cleaning and disinfection are concerns USDA APHIS VS closely coordinates with its regulatory partners including state and federal (e.g., USEPA can be involved in waste management) officials. USDA APHIS VS and state officials work together to evaluate disposal options based on the size of the flock, local conditions, and applicable laws and regulations to ensure the safe disposal of carcasses (USDA APHIS 2015b). USDA APHIS VS takes an integrated approach to disposal and recommends a single or combination of methods to ensure proper disposal with minimal potential to affect the environment and have HPAI stamped out quickly (USDA APHIS 2015b; 2017b).

There are multiple options for disposal (USDA APHIS 2017e). Composting, incineration, and disposal by managed landfill are methods that address the need to minimize negative environmental impacts while also mitigating virus spread. Composting at many sites is a common method of disposal including at sites in this outbreak and in the 2014–2015 HPAI outbreak; it can be performed on-site, either "in-house" or outdoors (with the appropriate cleaning and disinfection/biosecurity measures implemented in either case). Managed landfills may be equipped to handle such waste appropriately, though their ability or willingness to accept carcasses may vary. Incineration is another option, though fuel requirements, lower capacities, and smoke discharge can be challenging. On-site burial is an additional accepted means of disposal for small numbers of poultry, such as small backyard flocks, although this method may present significant issues related to potential environmental contamination with large numbers unless properly lined. Off-site burial may also be considered in a large HPAI incident depending on property size. In a widespread outbreak, multiple means of disposal may be required.

For the first seven states affected by HPAI outbreaks in 2022, disposal methods used have included:

- Outdoor composting (approximately 1.31 million birds at five commercial and three backyard premises),

- Indoor composting (approximately 500,000 birds at nine commercial facilities and one backyard premises),
- Combined indoor/outdoor composting (147,753 birds at one commercial premises),
- Off-site outdoor composting (approximately 900 birds from five backyard premises),
- On-site burial (approximately 6,700 birds from one commercial and two backyard premises),
- Incineration (approximately 800 birds from 22 backyard flocks),
- Combined on-site burial and incineration (approximately 40 birds from one backyard premises), and
- Landfill (approximately 330 birds from three backyard premises).

When done correctly following (USDA APHIS 2015a; 2017e) guidelines for disposal, these disposal methods reduce the likelihood of any potentially adverse environmental impacts. Of these birds disposed, only 1,860 birds from 28 premises were transported to off-site facilities for disposal. The remaining birds were disposed of on-site, which means that carcasses were not transported elsewhere. Transport to other locations could be necessary to address future outbreaks at specific premises that may not have the means to quickly dispose of carcasses.

USDA APHIS VS would provide technical assistance including assistance with implementing different methods, finding contractors to implement different methods or provide resources such as carbon for composting or determining landfills that will accept hazardous waste. Thus far in the 2022 outbreak, on-site composting has been the most used method.

Stringent biosecurity measures while handling HPAI infected poultry flocks are required to ensure that HPAI does not infect additional birds elsewhere (USDA APHIS 2016f; 2017e; 2022d). For example, during outbreaks, some equipment is moved between premises to depopulate flocks and dispose of carcasses. Equipment will need to be properly cleaned and disinfected to ensure that the disease does not spread if it is moved to another premises. Proper carcass composting piles with temperatures of 40 to 50 degrees Celsius (°C) (104 to 122°F) can eliminate the HPAI virus within three days (Guan et al. 2009).

USDA APHIS VS guidelines (USDA APHIS 2017e) were used during carcass management of affected barns and backyard poultry flocks in the 2022 outbreak to minimize risks to the public, farm workers, and poultry producers. The most up-to-date guidelines used for carcass management are in the Emergency Carcass Management Guide (USDA APHIS 2017b) that is updated regularly from insights gained during emergency response operations. The carcass management guidelines give guidance to USDA APHIS VS personnel and the public on what methods of disposal are available and the situations where they work best. In addition, the Carcass Management EIS discussed available disposal methods in detail (USDA APHIS 2015a).

People and vehicles transporting poultry, poultry products, and carcasses into and from the infected area can transport HPAI. State animal health officials quarantine poultry farms infected with HPAI and require quarantined farm operators to comply with biosecurity measures. A poultry biosecurity plan is recommended for all poultry farmers (ISU 2022). Biosecurity plans give site-specific

guidance on setting up a perimeter buffer area and a line of separation where personnel and vehicles are not allowed without going through cleaning and disinfection, defined parking areas for vehicles, a cleaning and disinfection station for vehicles coming and going on the premises, and for people coming and going from poultry barns to ensure HPAI is not transported into or out of a poultry holding facility, compost sites, feed bins, egg rooms, manure sheds, and other areas related to the poultry operation. Many methods can be used to disinfect vehicles and equipment used to transport poultry, poultry products, and carcasses including heat and registered disinfectants and soaps (USEPA 2022a). These biosecurity measures are used routinely and following an HPAI outbreak (USDA APHIS 2015a; 2017e).

For infected premises in the seven states covered by this EA, carcasses and litter have been transported for off-site disposal to landfills (three backyard premises), incinerators (23 backyard premises), and offsite outdoor composting sites (five backyard premises) during the 2022 outbreak (see Table 1 for details). As part of the HPAI response, stringent and effective biosecurity is one of the activities that is considered crucial to ensure HPAI does not spread (USDA APHIS 2016f).

There are many antimicrobial products available that may be used to disinfect vehicles, personnel, equipment, supplies, and buildings. Within poultry premises, areas or equipment that may require disinfection include egg processing equipment such as egg belts, flats, buggies, and packing machines; nesting boxes; and egg storage rooms. Production facilities may also consist of open floor areas, which require removal of litter and manure prior to disinfection efforts. It is an applicator's responsibility to ensure that a USEPA registered product is approved for HPAI disinfection and for the intended use site (USEPA 2022a).

Poultry production and carcasses release odors. Odors arise from the animals themselves, the livestock housing facility including feed, animal waste storage facilities, and the land application of waste (Zhao 2007). Odors are a varying complex mixture of free and particle-bound compounds (Bunton et al. 2007). Odorous plumes arising from poultry farms may contain inhalable dusts, bacteria, mold, hydrogen sulfide, ammonia, CH_4, pharmaceutical residues, and animal dander (Mirabelli et al. 2006). Livestock-related odors at public buildings may indicate the presence of airborne effluent beyond the agricultural land where it arose (Mirabelli et al. 2006). USDA APHIS VS and others (MBAH 2010; USDA APHIS 2017e) provides troubleshooting guidance for odor problems arising from disposal. For example, for burial pits, ensure they are covered soon after the carcasses and debris are inserted. For composting, consider the proper addition and layering of additives (e.g., carbon sources) to assist with odors. However, USDA APHIS VS does not manage odor. The responsibility to manage odor lies with the poultry owner.

State, regional, county, and municipal air pollution control entities can regulate odor emissions in their jurisdictions, but no federal standards and standardized measurement methodologies are yet to be enacted (Leonardos 1974; Finto 2012; USEPA 2018). For this reason, odors associated with animal feeding operation emissions are often regulated in response to nuisance complaints rather than demonstrated health effects (Finto 2012).

3.2.2.2 Potential Impacts: No Action Alternative

Under the No Action Alternative, upon request by a state, USDA APHIS VS would provide technical guidance, such as carcass management, disinfection of transportation equipment, and guidance in abating odors, but would not help with implementation of any of these activities. Because new knowledge is obtained as to the best methods to use while an outbreak is ongoing, it is expected that strategies will evolve and shift to account for this new knowledge in order to ensure the best and most effective methods are used to meet the goal to stamp out HPAI as quickly and efficiently as possible. Under this alternative, USDA APHIS VS would coordinate and share information on effective strategies with its State, local, and Tribal partners via consultation and make updated information available online, as applicable. Because under the No Action Alternative USDA APHIS VS would only provide technical guidance and recommendations with respect to carcass management, disinfection of transportation equipment, and abating odor, State agencies and poultry producers would provide the personnel directly responding to the HPAI outbreak. Contractors (e.g., truck drivers delivering carbon sources for composting, landfill operators picking up carcasses for off-site disposal, pesticide applicators) would be available to assist with activities, supplementing resources and operation assistance provided by the state and guidance provided by USDA APHIS VS. Under the No Action Alternative, USDA APHIS VS would only provide information on transportation, biosecurity measures, such as bagging carcasses in secure bags for disposal, and sanitizing trucks prior to leaving the premises, to ensure HPAI is not taken off the premises uncontained. Per 9 CFR Part 53, USDA APHIS VS makes compensation available for clean-up and disinfection when requirements are met.

3.2.2.3 Potential Impacts: Proposed Action Alternative

Under this alternative USDA APHIS VS would provide not just technical assistance and recommendations, but operational assistance in carcass management activities. Such assistance would help minimize any impacts from carcass management. USDA APHIS VS can provide a list of approved disinfectants and on a case-by-case basis and can assist with contracting to carry out disinfection (depending on resources locally available including personnel). USDA APHIS VS also assists in obtaining local sources for transportation, if necessary, to and from landfills, to off site fixed incinerators, or to off-site composting facilities. USDA APHIS VS personnel will likely assist with the implementation of carcass management and cleaning and disinfection. USDA APHIS VS provides training to its personnel on the various modes of disposal and biosecurity for transportation. USDA APHIS VS and state partners and poultry owners determine the appropriate methods for a given site. Therefore, potential spread of HPAI would likely be reduced with the additional assistance from USDA APHIS VS in operational activities with managing HPAI outbreaks.

3.2.3 Risks to Human Health

3.2.3.1 Baseline Condition

Human health hazards from animal diseases mainly depend on whether a disease is zoonotic. Zoonotic diseases can pass between animals and humans (CDC 2022b). That is, humans can become infected with a zoonotic animal disease if they are in contact with infected animals or animal products contaminated with the causative agent. The pathogenicity of an AI virus is generally species-specific and a virulent strain in birds usually has no association with the pathogenicity of that same virus to people. HPAI only applies to the effect the virus has on birds. The range of illness seen in birds, not humans, gives rise to the term "highly pathogenic" (Murti et al. 2015; CDC 2021).

The Centers for Disease Control and Prevention (CDC) considers the risk to people from HPAI A(H5N1) virus to be low because most strains of HPAI do not spread efficiently from person-to-person (Herfst et al. 2012; CDC 2022e). Human infections from AI viruses are rare (CDC 2022e). Five subtypes of avian influenza A viruses (H5, H6, H7, H9, and H10 viruses) have caused respiratory illnesses in people. H5N1 and H7N9 viruses are responsible for most infections in people (CDC 2022d). According to the World Health Organization (WHO), since 2003, 18 countries have reported 863 sporadic human infections with HPAI A(H5N1) viruses resulting in 456 deaths (WHO 2021).

In the countries where HPAI crossed the species barrier to humans, sporadic human infections resulted from direct or close contact with infected sick or dead poultry (Sonnberg et al. 2013). People in prolonged contact with infected poultry are at the greatest risk of contracting strains of bird flu that have the genes for virulence in humans. This typically includes poultry producers and USDA APHIS VS workers (CDC 2015a; Moore et al. 2021).

As of August 9, 2022, there has been one confirmed human case of HPAI during the current outbreak in the United States. A male resident of Colorado was exposed to HPAI while he worked with an H5N1 positive commercial poultry culling operation between April 18 and April 22. On April 20, the individual exhibited symptoms of fatigue. Avian influenza was confirmed on April 27 in the individual, followed by confirmation of subtype N1 on April 29. The individual was treated with antiviral medication and has since fully recovered (WHO 2022). On April 20 and again on April 28, nine close contacts of the individual were tested for HPAI H5N1. All tests were negative, indicating a low risk of human-to-human transmission.

Exposure by the general public is unlikely to occur during an emergency response situation where depopulation is done quickly and in accordance with guidelines and standard operating procedures and when there is quick and proper disposal of poultry carcasses. Human-to-human transmission of these strains is very rare, limited, and not sustained (CDC 2015b). Additionally, the proper handling and cooking of poultry and eggs to an internal temperature of 165˚F kills bacteria and viruses.

Individual producers or growers are the so-called "first in line" to potentially contract HPAI because of their close association with their flocks. Direct or indirect exposure to infected live or dead poultry, or a virus contaminated environment, is the primary risk factor for human infection (WHO 2011). During an outbreak of AI among poultry, people who contact infected birds, or surfaces that are contaminated with secretions or excretions from infected birds, are at higher risk of infection than the general population (CDC 2015a; Venter et al. 2017). CDC and USDA APHIS have coordinated to develop guidance for local, state, and federal public health authorities for monitoring responders for influenza-like illness during and after HPAI mobilization efforts (USDA APHIS 2022g).

Individuals and contractors also may remove carcasses, build compost piles, load birds into incinerators, transport carcasses to the landfill, clean and disinfect vehicles, equipment, and materials, and clean and disinfect premises. With every action, there is a potential risk of contracting AI; however, risks are reduced using the appropriate personal protective equipment and properly trained and qualified personnel. During an HPAI outbreak response, USDA APHIS VS implements influenza-like illness monitoring for responders in the field (USDA APHIS 2017e; 2022g). As part of this monitoring, responders will be actively monitored for illness during their exposure and for 10 days after their last exposure. USDA APHIS VS will provide all USDA APHIS responders with mobilization instructions, including a description of the monitoring plan, a list of signs and symptoms consistent with respiratory illness or conjunctivitis, and instructions to report symptoms to APHIS Safety Officers immediately. USDA APHIS VS and CDC will train all USDA APHIS Safety Officers on the procedures specified in the monitoring plan (USDA APHIS 2022g).

While some chickens and turkeys die from AI before emergency responders can get to the birds, some sick or exposed birds must be depopulated (USDA APHIS 2015b). USDA APHIS VS may use or recommend use of CO_2 or Class A fire-suppression foam (Phos-Chek® WD881 or Silv-Ex Plus® Class A Foam Concentrate) to depopulate birds inside of commercial poultry houses. Both depopulation chemicals have non-flammable and non-explosive properties, are used over a short period of time, and are not expected to significantly impact air quality around poultry production facilities. The foam technology recommended and utilized by USDA APHIS VS does not contain PFAS, which break down very slowly in the environment and may be linked to harmful health effects in human and animals.[12]

If CO_2 is used during depopulation events, it is vented to the atmosphere where it is not of a sufficient concentration or volume to pose a human health risk. Because CO_2 gas is heavier than air, it will accumulate in higher concentrations indoors near the floor (AAAP 2021). Risk of worker exposure to CO_2 can be minimized by using the appropriate PPE, wearable gas monitors, and making sure sufficient ventilation time has been given prior to reentry. Water-based foam can be slippery, presenting a physical hazard to workers. Depopulation using foam, whole-house CO_2, and VSD+ requires less labor and bird handling than other methods. Depopulation using water-based foam potentially reduces the number of workers involved, decreases their exposure to zoonotic

[12] For more information on PFAS see PFAS Explained | US EPA.

HPAI viruses, is relatively easy to deploy, and mitigates physical threats to responders depopulating in a structurally unsound building (USDA APHIS 2015c).

Depopulation using cervical dislocation, decapitation, captive bolt, gunshot, and injectable euthanasia agents requires birds to be handled individually by responders specifically trained to safely use each method. Although the appropriate PPE is worn during for each method of depopulation, the increased physical exertion with these methods could result in workers becoming fatigued or overheated if the number of birds to depopulate is too large. These depopulation methods would be limited to small sized flocks, or a larger number of workers would be needed which could delay depopulation. Use of foam, CO_2 or VSD+ limits worker contact with HPAI-infected birds, while depopulation using cervical dislocation, decapitation, captive bolt, gunshot, and injectable euthanasia agents requires direct contact with infected birds and increases the exposure risk of workers to the virus. The choice of depopulation method is often dictated by the type and size of poultry operation and the availability of resources required to implement a specific method.

Many depopulation methods have inherent risks, but training minimizes these risks. For example, USDA APHIS personnel that use firearms are trained and certified in use and risks have been analyzed (USDA APHIS 2019c). Sharps (e.g., needles and scalpels) used to collect samples or inject euthanasia agents can potentially cause injury to the personnel using them. The CDC (2011) estimated that 385,000 sharps-related injuries occur annually in United States hospitals alone, which gives a clear picture of the risk. USDA APHIS requires training for all employees handling sharps to obtain biological samples or euthanize animals. The sharps training emphasizes preparing work areas with all necessary equipment ahead of time, using sharps with safety features, substituting plastic ware for glassware, disposing of needles properly, and working in well ventilated areas or upwind of contaminated sites (i.e., avoid contracting a disease).

USDA APHIS VS evaluated the potential effects of carcass management activities on human health in the Carcass Management EIS (USDA APHIS 2015a); that information is being incorporated here by reference.

Pathogens can inadvertently be carried off-site by workers, visitors, or intruders. Site biosecurity systems prevent unauthorized personnel from accessing the area and spreading disease. Decontamination of personnel prevents cross-contamination and minimizes the risk of transporting disease agents (Baird and Savell 2004). These practices minimize potential health effects to off-site workers and the general public. Biosecurity is an important aspect of the NPIP (USDA APHIS 2020) and is discussed in detail therein. All individuals that have access to a quarantined premises, including response personnel, essential delivery and service personnel, producers, and any residents living and working on the poultry facility, need to comply with the same level of established biosecurity measures. Coordination is necessary to ensure all are aware of the necessary procedures to enter/exit the facility. Biosecurity standard operating procedures are detailed as part of the USDA APHIS Foreign Animal Disease Preparedness and Response Plan (USDA APHIS 2016e) and include entries and exits to and from poultry houses, boot washes, change of clothes (e.g., Tyvek

suit and latex gloves put on going in and disposed exiting), vehicle sanitization site, vehicle parking areas, and designated zones for nonpoultry workers.

Biosecurity is equally important on premises that are uninfected in order to avoid introducing HPAI into susceptible flocks and prevent HPAI spread from infected, yet undetected, flocks. During an HPAI outbreak, response personnel may be deployed to conduct selected, restricted activities on premises presumed to be uninfected. If possible, it is preferred that responders do not enter uninfected premises and instead the producer or veterinarian collects and submits diagnostic samples. Following biosecurity plans not only protects flocks, but also decreases the potential for human exposure to the HPAI virus. Responders will need a biosecurity plan for their activities or will follow biosecurity protocols in effect at the site being entered (USDA APHIS 2016e).

Decontamination of sites where HPAI has been detected requires the use of disinfectants. Over 200 products are registered for use in disinfecting premises for HPAI (USEPA 2022a). The choice to use a particular disinfectant (e.g., ammonium, hydrogen peroxide, iodine, and chlorinated products) by a producer would likely follow a conversation involving state and federal personnel. Users must follow the disinfection product label directions to safely handle and use the product and avoid harm to human health and the environment.

Carcass management operations are permeated with odors. The primary odor is the smell of decaying animal flesh, which causes revulsion in most humans. To a certain extent, the human nose becomes desensitized during extended exposure to any smell, therefore acute distress is likely to be felt by workers only from time to time. Passersby are likely to avoid the smells by leaving the area and closing vehicle windows. People residing downwind from a carcass management operation are not likely to be able to avoid periodic wafting odors.

The sights and odors from many carcasses can be emotionally upsetting to humans because human sympathies and compassion are invoked. Poultry producers or backyard flock owners associated with an HPAI outbreak, and their families, could suffer psychologically from the loss of animals, disruptions in community life, and from stress over concern for their financial future. Mental health counseling can help to mitigate psychological health impacts associated with an outbreak (USDA APHIS 2017e).

Depopulation, decontamination, and disposal workers could suffer psychologically from seeing and smelling the carcasses while they work (USDA APHIS 2017e). Acute distress is likely to be felt by workers when initially confronted with odors until their olfactory system becomes desensitized during continuous exposure. The use of personal protective equipment, such as respirators, may minimize the effects. These impacts are short in duration as the birds are depopulated typically within 24-48 hours of identification of the HPAI virus, and disposal occurs rapidly.

3.2.3.2 Potential Impacts: No Action Alternative

Under the No Action Alternative, USDA APHIS VS would not be involved in operational activities including bird depopulation, disposal of carcasses, and cleaning and disinfection of equipment and

premises. USDA APHIS VS employees would not be at risk for infection from HPAI or psychological impacts due to lack of participation in operational activities during these outbreaks and thus lack of exposure to infected birds and premises. However, individual producers, their families, and contractors involved in responding to an HPAI outbreak could potentially be at risk from exposure to the HPAI virus and to physical injuries and psychological impacts due to their involvement in performing response activities. USDA APHIS VS could identify a National Incident Coordinator and Incident Commander, but the State and Poultry owners would oversee the primary on the ground operations of depopulation, disposal, disinfection, and necessary transportation.

Variables that could affect the potential risks to human health under this alternative include the extent of the outbreak (i.e., the size of the affected flock(s) and the number of premises involved), previous experience of the State and local entities and producers with dealing with an HPAI outbreak, and the resources (i.e., personnel and funding) of the State and the producers available to respond to an outbreak. During the HPAI outbreak that occurred from December 2014 to June 2015 in 21 states, 7.4 million turkeys and 43 million egg-layers were affected by HPAI and died from the disease or were depopulated at 232 affected premises (USDA APHIS 2016a). Over the course of the entire outbreak, there were 1,220 deployments by USDA APHIS VS personnel, with 773 total individuals deployed; approximately 300 additional USDA APHIS VS employees worked virtually or from USDA APHIS VS headquarters. At the peak of the outbreak, USDA APHIS VS had 3,000 contractors deployed (USDA APHIS 2016a). If State and local officials do not have experience or sufficient resources to quickly respond to an HPAI outbreak, the virus may spread to additional flocks and premises. Crews working disposal and clean-up/disinfection may not be experienced or may be overwhelmed, leading to mistakes that could lead to injuries or exposure to the HPAI virus. States may choose to consult with USDA APHIS VS for advice during an emergency response and USDA APHIS VS protocols, guidance, and response information are available to the public for reference and use (see (USDA APHIS 2017e; 2022d)), States have strict guidelines, as well, and health and safety issues would probably be similar under both alternatives when the HPAI outbreak is limited in size and location. However, for large outbreaks, USDA APHIS VS experience and resources that would be missing under the No Action Alternative, could result in a less timely and effective response, which in turn could adversely affect human health. A small outbreak may be adequately handled by State and local resources with little risk to health and safety.

3.2.3.3 Potential Impacts: Proposed Action Alternative

Under the Preferred Alternative, USDA APHIS VS as the lead federal responder with some assistance from USDA APHIS WS as needed, would provide disease monitoring and surveillance, and operational assistance to states, localities, and tribes, as needed, in depopulation, carcass management, and cleaning and disinfection in response to HPAI virus outbreaks as they occur across the nation. USDA APHIS VS employees may fill many roles in the response operations, including, but not limited to disease monitoring and surveillance and overseeing depopulation, disposal, and disinfection, assisting in implementation of depopulation and disposal activities, and administration. USDA APHIS VS also may be issuing contracts with several entities to provide support in the depopulation and disposal of poultry and cleaning and decontamination of premises. The additional contribution of USDA APHIS VS resources and experience would help assure a

rapid scale-up of organizational structures, coordination, and resources needed for a timely response to an outbreak and reduce the health and safety risks to responders.

Under this alternative, at the onset of an HPAI outbreak, USDA APHIS VS would identify a National Incident Coordinator and an Incident Commander and may deploy National Incident Management Teams to affected locations. Incident Command Posts (ICPs) would be established, serving as the base of deployment for field personnel (USDA APHIS 2017e). A Safety Officer would be assigned to an ICP to ensure the health and safety of all responders (including USDA APHIS VS employees, temporary employees, or contractors). The Safety Officer would develop a site-specific health and safety plan to establish safe work procedures and has the authority to stop an operation to correct safety or health hazards (USDA APHIS 2014a). USDA APHIS VS would provide PPE to its employees and require its contractors to follow all appropriate worker protection standards. Prior to any carcass management work, contracted companies are responsible for briefing their workers on the nature of the disease and training them in specific hygiene requirements. USDA APHIS (2022g) in coordination with CDC, developed occupational guidance and protocols for monitoring responders for influenza-like illness during and after mobilization. It is likely, that with an established incident response plan, experienced personnel, and funding, there is less potential for impacts to human health and safety under this alternative because personnel are wearing appropriate PPE and are trained to minimize contact with the HPAI virus.

3.2.4 Risks to Wildlife

3.2.4.1 Baseline Condition

Worldwide, AI was isolated from more than 100 different species of wild birds (CDC 2022a). HPAI viruses cause morbidity and mortality in a wide variety of wild birds (USDA APHIS 2015d). Influenza A viruses also include viruses that cause influenza in horses, pigs, domestic cats, tigers, leopards, and dogs (CFSPH 2005-2016; Toro et al. 2010). These AI viral strains change through mutation, shift, or drift, causing the emergence of new types of viruses with differing pathogenicity (CFSPH 2005-2016). While it is typical for an influenza virus to infect only a host-specific species (i.e., equine influenza in horses or canine influenza in dogs), these viruses occasionally infect other species.

Migratory waterfowl are a natural reservoir for AI, and movement of wild birds carrying HPAI can spread the virus to poultry (USDA APHIS 2020a; Moore et al. 2021). From January 1 to July 12, 2022, USDA APHIS WS detected 1,826 cases of HPAI in wild birds, primarily in hunter-harvested, trapped, sampled, and released waterfowl, and from found wild bird mortalities. These detections included several species of ducks, geese, and other waterfowl, gulls and terns, turkeys, pheasants, grebes, shorebirds, raptors, crows and ravens, loons, storks, cormorants, and songbirds in 42 states and the District of Columbia (USDA APHIS 2022a) (see Figure 1) . In contrast, the risk to wild birds such as waterfowl and gulls from HPAI in leachate from landfills accepting poultry carcass waste is low to negligible (USDA APHIS 2020b).

USDA APHIS VS finds wild birds generally are responsible for introducing HPAI into commercial poultry but given the proximity of wild birds and other animals to poultry, it is possible for HPAI-infected poultry to introduce the virus to healthy wild birds. Smaller birds could be exposed to HPAI if they gain access to poultry houses with infected poultry. As part of flock biosecurity, federal and state personnel, farm managers, and contractors monitor farms and conduct wildlife management activities such as reducing wild birds and rodents, as well as insects, from entering and exiting poultry barns with exclusion, traps, and shooting to minimize the spread of the HPAI virus from contact of wildlife with poultry and using appropriate disposal measures to minimize the exposure of wild populations to infected carcasses.

During this current outbreak, HPAI has been detected in mammalian scavengers including two Virginia opossums (*Didelphis virginianus*), a coyote (*Canis latrans)*, 49 red foxes (*Vulpes vulpes*), two bobcats (*Lynx rufus*), six northern raccoons (*Procyon lotor*), three striped skunks (*Mephitis mephitis*), nine harbor seals (*Phoca vitulina*), a gray seal (*Halichoerus grypus*), and a dolphin (*Tursiops truncates*) in 11 states, including Maine, Michigan, and New York (USGS 2022). It is suspected that mammals primarily get the disease by consuming HPAI-infected wild birds or their carcasses. HPAI infections in mammals are isolated and all infections occurred subsequent to the end date for information used in the draft EA and will be addressed in more detail in the supplemental NEPA document being prepared by USDA APHIS VS.

Migratory Bird Treaty Act

The Migratory Bird Treaty Act of 1918 (MBTA), as amended (16 U.S.C. 703–712) established a federal prohibition, unless permitted by regulations, "to pursue, hunt, take, capture, kill, attempt to take, capture or kill, possess, offer for sale, sell, offer to purchase, purchase, deliver for shipment, ship, cause to be shipped, deliver for transportation, transport, cause to be transported, carry, or cause to be carried by any means whatever, receive for shipment, transportation or carriage, or export, at any time, or in any manner, any migratory bird or any part, nest, or egg of any such bird." U.S. Fish and Wildlife Service (USFWS) released a final rule on April 16, 2020, identifying 1,093 birds on the Revised List of Migratory Birds (USDI FWS 2020).

Executive Order 13186, "Responsibilities of Federal Agencies to Protect Migratory Birds," issued on January 10, 2001, directs federal agencies taking actions with a measurable negative effect on migratory bird populations to develop and implement a memorandum of understanding (MOU) with USFWS that promotes the conservation of migratory bird populations. On August 2, 2012, USFWS and USDA APHIS signed an MOU to facilitate the implementation of this Executive Order (USDA APHIS and USDI FWS 2012), The MOU provides USDA APHIS with guidance to avoid and minimize, to the extent practicable, detrimental migratory bird habitat alteration or unintentional take during animal management activities. This includes:

a) Evaluating a reasonable range of alternatives in environmental reviews to avoid and minimize adverse effects to migratory birds or degradation of habitats while still fulfilling the mission to protect American agriculture. Develop practices, in

coordination with USFWS, to avoid and minimize impacts to migratory birds and their habitat and determine how to improve evaluation of impacts.

b) Assessing and estimating the effects of proposed actions on migratory birds and their habitats through the project planning process, including NEPA. Use best available demographic, population, behavioral, and habitat data in the assessment of effects upon migratory birds. If sufficient data are unavailable, attempt to acquire necessary data by working with Federal, State, and other partners.

c) Working collaboratively with FWS and other partners, and develop partnerships with non-federal entities, to monitor migratory birds, as resources allow and within the Agency's capabilities and authorities, to improve and better understand the need for, and effectiveness of, conservation efforts tied to projects under the APHIS authority.

d) Adhering to APHIS policy that a range of approaches and alternatives be considered before bird-damage control programs are selected. This includes considering the species responsible for the damage and the frequency, extent, and magnitude of the damage. In addition to damage confirmation and assessment, consideration will be given to the status of target and potential non-target species, local environmental conditions, relative costs of applying management techniques, environmental impacts, and social and legal concerns. This includes using non-lethal alternatives prior to implementing lethal control programs, when possible, and implementing measures to minimize impacts to non-target species.

e) Complying with regulation and permit conditions that identify the type of ammunition, firearm, and other methods available for use while conducting management activities. Compliance with regulations and permit conditions that limit the use of lead ammunition during migratory bird take actions will reduce the amount of lead in migratory bird habitats.

The migratory birds of conservation concern that occur in the impacted states in this EA are listed in Table 2 (USFWS IpaC 2022). Birds of conservation concern are bird species, subspecies, and populations of migratory nongame birds that, without additional conservation actions, are likely to become candidates for listing under the Endangered Species Act. The Birds of Conservation Concern 2021 List (USFWS 2021b) identifies the migratory nongame bird species that represent USFWS' highest conservation priorities, following those that are listed as threatened or endangered.

Table 2. Migratory birds or birds of conservation concern that occur in the impacted geographic area for this EA.

Common name	Scientific name	Breeding Season	States of Occurrence
American golden-plover	*Pluvialis dominica*	Elsewhere	IN KY MI NY
American kestrel	*Falco sparverius paulus*	Apr. 1-Aug. 31	KY VA
American oystercatcher	*Haematopus palliatus*	Apr. 15-Aug. 31	DE ME NY VA

Common name	Scientific name	Breeding Season	States of Occurrence
Atlantic puffin	*Fratercula arctica*	Apr. 15-Aug. 31	DE ME NY
Bachman's sparrow	*Aimophila aestivalis*	May 1-Sept. 30	KY
Band-rumped storm-petrel	*Oceanodroma castro*	Elsewhere	NY
Bicknell's thrush	*Catharus bicknelli*	June 10-Aug. 20	ME NY VA
Black guillemot	*Cepphus grylle*	May 15-Sept. 10	ME NY
Black scoter	*Melanitta nigra*	Elsewhere	DE ME NY VA
Black skimmer	*Rynchops niger*	May 20-Sept. 15	DE ME NY
Black tern	*Chlidonias niger*	May 15-Aug. 20	IN MI
Black-billed cuckoo	*Coccyzus erythropthalmus*	May 15-Oct. 10	DE IN KY ME MI NY VA
Black-capped chickadee	*Poecile atricapillus practicus*	Apr. 10-July 31	KY NY VA
Black-legged kittiwake	*Rissa tridactyla*	Elsewhere	DE ME NY VA
Black skimmer	*Rhynchops niger*	May 20-Sept. 15	VA
Blue-winged warbler	*Vermivora pinus*	May 1-June 30	DE MI ME NY VA
Bobolink	*Dolichonyx oryzivorus*	May 20-Jul. 31	DE IN KY ME MI NY VA
Brown pelican	*Pelecanus occidentalis*	Jan. 15-Sept. 30	DE NY VA
Canada warbler	*Cardellina canadensis*	May 20-Aug. 10	DE IN KY ME MI NY VA
Cape May warbler	*Setophaga tigrina*	June 1-July 31	ME NY
Cerulean warbler	*Dendroica cerulea*	Apr. 28-Jul. 20	DE IN KY ME MI NY VA
Common eider	*Somateria millissima*	June 1-Sept. 30	DE ME NY VA
Common loon	*Gavia immer*	Apr. 15-Oct. 31	DE ME NY VA
Common murre	*Uria aalge*	Apr. 15-Aug. 15	ME NY
Common tern	*Sterna hirundo*	May 1-Aug. 31	MI
Connecticut warbler	*Oporornis agilis*	June 15-Aug. 10	MI
Cory's shearwater	*Calonectris diomedea*	Elsewhere	ME NY VA
Double-crested cormorant	*Phalacrocorax auritus*	Apr. 20-Aug. 31	DE ME NY VA
Dovekie	*Allle*	Elsewhere	DE ME NY VA
Eastern whip-poor-will	*Antrostomus vociferus*	May 1-Aug. 20	DE IN KY ME MI NY VA
Evening grosbeak	*Coccothraustes vespertinus*	May 15-Aug. 10	ME MI NY
Golden-winged warbler	*Vermivora chrysoptera*	May 1-Jul. 20	IN KY MI NY VA
Great shearwater	*Puffinus gravis*	Elsewhere	DE ME NY
Great skua	*Stercorarius skua*	Elsewhere	ME
Gull-billed tern	*Gelochelidon nilotica*	May 1-July 31	DE ME NY VA
Henslow's sparrow	*Ammodramus henslowii*	May 1-Aug. 31	IN KY MI NY VA
Hudsonian godwit	*Limosa haemastica*	Elsewhere	DE IN ME MI NY VA
Kentucky warbler	*Oporornis formosus*	Apr. 20-Aug. 20	DE IN KY ME MI NY VA
King rail	*Rallus elegans*	May 1-Sept. 5	DE IN KY MI NY VA
Le Conte's sparrow	*Ammodramus leconteii*	June 1-Aug. 15	IN KY MI VA
Lesser yellowlegs	*Tringa flavipes*	Elsewhere	DE IN KY ME MI NY VA
Long-eared owl	*Asio otus*	Mar.1-July 31	DE IN ME MI NY VA
Long-tailed duck	*Clangula hyemalis*	Elsewhere	DE ME NY VA
Magnificent frigatebird	*Fregata magnificens*	Elsewhere	NY
Manx shearwater	*Puffinus puffinis*	Apr. 15-Oct. 31	DE ME VA
Marbled godwit	*Limosa fedoa*	May 1-July 31	IN KY MI VA
Northern saw-whet owl	*Aegolius acadicus*	March 1-July 31	KY NY VA
Olive-sided flycatcher	*Contopus cooperi*	May 20-Aug. 31	ME MI NY
Pomarine jaeger	*Stercorarius pomarinus*	Elsewhere	DE ME NY VA
Prairie warbler	*Dendroica discolor*	May 1-July 31	DE IN KY ME MI NY VA
Prothonotary warbler	*Protonotaria citrea*	Apr. 1-July 31	DE IN KY ME MI NY VA
Purple sandpiper	*Calidris maritma*	Elsewhere	DE ME NY VA
Razorbill	*Alca torda*	June 15-Sept. 10	DE ME NY VA
Red-breasted merganser	*Mergus serrator*	Elsewhere	DE ME NY VA

Common name	Scientific name	Breeding Season	States of Occurrence
Red-headed woodpecker	*Melanerpes erythrocephalus*	May 10-Sept. 10	IN KY ME MI NY VA
Red-necked phalarope	*Phalaropus lobatus*	Elsewhere	DE ME NY VA
Red phalarope	*Phalaropus fulicarius*	Elsewhere	DE ME VA
Red-throated loon	*Gavia stellata*	Elsewhere	DE ME NY VA
Ring-billed gull	*Larus delawarensis*	Elsewhere	DE ME NY VA
Roseate tern	*Thalasseus maximus*	Apr. 15-Aug. 31	DE ME NY VA
Royal tern	*Thalasseus maximus*	Apr. 15-Aug. 31	ME NY VA
Ruddy turnstone	*Arenaria interpres morinella*	Elsewhere	DE IN KY ME MI NY VA
Rusty blackbird	*Euphagus carolinus*	Elsewhere	DE IN KY ME MI NY VA
Short-billed dowitcher	*Limnodromus griseus*	Elsewhere	DE IN KY ME MI NY VA
Sooty tern	*Onychoprion fuscatus*	Mar. 10-July 31	DE NY VA
South polar skua	*Stercorarius maccormicki*	Elsewhere	ME NY
Surf scoter	*Melanitta perspicillata*	Elsewhere	DE ME NY VA
Swallow-tailed kite	*Elanoides forficatus*	March 10-June 30	KY VA
Thick-billed murre	*Uria lomvia*	Apr. 15-Aug. 15	ME NY
White-winged scoter	*Melanitta fusca*	Elsewhere	DE ME NY VA
Willet	*Tringa semipalmata*	Apr. 20-Aug. 5	DE KY ME NY VA
Wilson's plover	*Charadrius wilsonia*	Apr. 1-Aug. 20	VA
Wilson's storm-petrel	*Oceanites oceanicus*	Elsewhere	DE ME NY VA
Wood thrush	*Hylocichla mustelina*	May 10-Aug. 31	DE IN KY ME MI NY VA
Yellow rail	*Coturnicops noveboracensis*	May 15-Sept. 10	IN KY MI VA

Source: (USFWS IpaC 2022)

Potential adverse effects could occur from birds consuming carcasses contaminated with euthanasia solutions or lead particles from ammunition or infected with HPAI. If shooting is used to depopulate birds, mostly non-lead ammunition is used because birds are mostly taken with nontoxic shot, with the exception that lead bullets maybe used for taking backyard poultry, such as ratites or free-ranging poultry, that cannot be caught by other means. Safe, accurate, nontoxic bullets may not always be readily available and, therefore, lead may be used (e.g., .22 caliber rifle bullets). However, most carcasses are gathered and disposed of properly, which mitigates the risks associated with lead, as well as potentially infected birds. USDA APHIS WS personnel are certified to use firearms. Risks associated with the use of firearms to take wild birds at the poultry barns, such as house sparrows and starlings, or in the field to take free-ranging poultry that cannot be caught have been analyzed in other NEPA documentation (USDA APHIS 2019c) if these methods are used for biosecurity. Risks associated with the use of lead by USDA APHIS WS throughout the WS program have also been analyzed and found to be minimal (USDA APHIS 2017f). The use of firearms and associated lead should have at most, a very minimal potential to impact the birds of conservation concern given their diet and nature. It is doubtful that the three raptor species, American kestrel, northern saw-whet owl, and swallow-tailed kite, would be affected because they typically feed on insects and small mammals and are not known to scavenge. The ring-billed gull would be the only species that likely could be affected because they will feed on any available food and frequent landfills and compost piles, especially where they are not managed appropriately. We believe that the risks are negligible for the birds of conservation concern from the methods used.

USDA APHIS VS recommends for use and uses CO_2 or Class A fire-suppression foam (such as Phos-Chek® WD881 Class A Foam Concentrate) to depopulate birds inside of commercial poultry houses. If migratory birds were to ingest poultry depopulated using these methods, no toxic effects

are expected because the ingredients are nontoxic (exposure route is inhalation). The WD881 label restricts use near water sources. In addition, use of captive bolts, cervical dislocation, decapitation, and VSD+ would not expose migratory birds to toxic substances because none are used with these methods.

Animals euthanized with sodium pentobarbital are toxic to scavengers. Following several secondary poisoning incidents, the FDA updated its euthanasia solution regulations in 2003 stating "Euthanized animals must be properly disposed by deep burial, incineration, or other method in compliance with the state and local laws to prevent consumption of carcass material by scavenging wildlife" (21 CFR 522.900). Well-vascularized organs, such as the liver, have the highest concentrations of pentobarbital; subsequently, the degree of intoxication will depend on the amount and type of tissue ingested. Bald and golden eagles tend to move quickly to fresh carcasses, they prefer viscera, and have a narrow tolerance for barbiturates making them more susceptible to secondary poisoning from pentobarbital than other species (Krueger and Krueger 2000). Eagle and other species deaths have been reported in at least 16 states and in Canada as a result of scavenging on carcasses of euthanized farm animals or pet horses left in the field, or small animal carcasses that were unburied or exposed at landfills (Krueger and Krueger 2000). Animals that ingest tissue contaminated with pentobarbital may become disoriented or comatose, and death may occur (Krueger and Krueger 2000). Thus, euthanized animals are disposed of appropriately, mostly through incineration or deep burial and stored prior to disposal in a secured location that scavengers cannot access.

While exposure to HPAI-infected carcasses could adversely affect migratory birds, USDA APHIS VS and its cooperators take steps to prevent this from occurring. Wild birds would not have access to carcasses during transport. For example, carcasses transported from poultry houses to off-site disposal locations are placed in lined roll-off containers and covered with secure tarps prior to transport. Indoor composting and incineration of carcasses will reduce the likelihood of any contact between migratory birds and carcasses because the carcasses are contained within barns or in containers. When using disinfectants to treat poultry facilities, USDA APHIS VS, and state and private partners comply with all applicable federal and state laws, which minimizes the risk to birds of conservation concern. USDA APHIS VS, if it conducts disinfection, will ensure it follows product labeling for the use of commercial disinfectants. Finally, to minimize risks of transmitting HPAI to wild birds, biosecurity steps, such as changing clothes or donning Tyvek suits, latex gloves and disposing of them after use, boot washes, disinfecting vehicles, and reducing wild bird, rodent and insect populations coming and going from poultry facilities as discussed in ISU (2022) and (USDA APHIS 2022c; 2022d) will be taken to minimize any further spread of HPAI so that birds of conservation concern are not affected.

Landfill, on-site burial, and outdoor composting could potentially expose scavenging birds to carcasses if they are left uncovered. However, covering the carcasses with soil or other material prevents wildlife from accessing them. Landfilled and buried carcasses are covered with several feet of soil or other material, preferably within 30 minutes of placement. Composted carcasses are covered with 8 to 12 inches of clean material such as wood chips. Scavenging birds regularly feed on exposed wildlife carcasses, which exposes them to any reservoir of disease-causing viruses in

those birds. As a result, the natural threat to scavenging birds from infected wildlife carcasses is much greater than exposure to infected poultry carcasses being disposed of by these methods.

Birds could be adversely impacted by stressors such as vegetation removal, human disturbance, noise, and chemical contamination. Conservation measures, such as surveying for nests prior to vegetation removal, avoiding parking equipment in vegetation where migratory birds are nesting, and minimizing vegetation removal, can reduce the impacts of these stressors on migratory birds. Carcass management activities will take place on previously cleared private property. While the presence of humans may increase during disease management activities, any birds frequenting these properties are already likely acclimated to the presence of humans. Likewise, the temporary increase in noise associated with carcass management activities will likely have a negligible impact on migratory birds at affected facilities.

Eagle Protection

Bald and golden eagles are protected by the Bald and Golden Eagle Protection Act, as amended (16 U.S.C. 668 et seq.), the MBTA, and the Lacey Act of 1907, as amended (16 U.S.C. 3371-3378). The regulations implementing these Acts prohibit take of bald or golden eagles unless permitted by USFWS. For these birds, the term "*take*" means "*pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, destroy, molest, or disturb*" (50 CFR 22.3). Disturb means "*to agitate or bother to a degree that causes, or is likely to cause . . . injury . . . a decrease in its productivity or nest abandonment by substantially interfering with normal breeding, feeding, or sheltering behavior*" (50 CFR 22.3).

The bald eagle (*Haliaeetus leucocephalus*) has a widespread distribution in North America and is flourishing in the United States. The largest North American breeding populations are in Alaska, Canada, in the Great Lakes States, Florida, the Pacific Northwest, the Greater Yellowstone area, and the Chesapeake Bay region. Bald eagles are opportunistic feeders that occupy and defend their territories against intrusion by other eagles. Although fish comprise much of their diet, they also eat carrion, birds, small mammals, and turtles. They will also feed on carcasses along roads, in landfills, and at feedlots (USFWS 2007).

Golden eagles (*Aquila chrysaetos canadensis*) can be found from the tundra, through grasslands, forested habitat and woodland-brushlands, south to arid deserts, including Death Valley, California. They are aerial predators and eat small to mid-sized reptiles, birds, and mammals up to the size of mule deer (*Odocoileus hemionus*) fawns and coyote (*Canis latrans*) pups (USFWS 2011). They scavenge and eat carrion, particularly during the winter (Watson et al. 2019).

Bald and golden eagles locate fresh carcasses quickly, which makes them susceptible to secondary poisoning when food sources contain lead contaminants (Watson et al. 2019) or are left uncovered after being euthanized (USFWS 2007). However, eagles will not be exposed to euthanasia chemicals from depopulation activities because HPAI-infected poultry are mostly depopulated using CO_2 or water-based foam. In addition, use of captive bolts, cervical dislocation, decapitation, and VSD+ would not expose eagles to toxic substances because none are used with these methods.

Efforts will be made to prevent eagles from accessing carcasses. If they were to ingest poultry depopulated by these methods, then there would be no toxic effects. The concern would be the spread of HPAI. Use of lead will be minimal as mostly nontoxic shot is used for depopulation activities. However, if bullets are used, eagles could potentially be exposed. With that said, most carcasses are retrieved and disposed of properly to ensure that HPAI is not spread by carcasses. Thus, we believe that depopulation activities will have no effect on eagles.

Activities in nesting areas of eagles during the breeding season can affect the nesting success and could cause eagles to abandon the nest. Disturbance of eagle roosting and foraging areas can also negatively affect bald eagles. However, disturbance of eagle nesting, roosting, and foraging sites is unlikely because the areas around commercial poultry facilities are busy areas and composting and burial sites will be only placed on farmed croplands. Eagles are unlikely to be disturbed by routine use of roads, homes, and other facilities when the use in that area pre-dates the eagles' successful nesting activity. For this reason, USFWS guidelines recommend that in most cases, ongoing existing uses may proceed with the same intensity with little risk of disturbing eagles (USFWS 2007). However, USFWS recommends that human activities should be kept as far away from nest trees as possible, and that potentially disruptive activities should be minimized, including development in the eagles' direct flight path between their nest and roost sites and important foraging areas (USFWS 2007).

On-site burial, outdoor composting, and landfilling could potentially expose eagles to carcasses infected with HPAI if they are left uncovered. However, landfilled and buried carcasses are covered with several feet of soil or other material, and composted carcasses are covered with 8 to 12 inches of clean material such as wood chips. Covering the carcasses with soil or other material will prevent eagles from accessing them and becoming infected with HPAI. As with other migratory birds, scavenging birds, such as eagles, regularly feed on wildlife carcasses; wildlife is an endemic reservoir of HPAI. Therefore, the threat to eagles from exposure to disposed infected poultry carcasses is minor in comparison to the natural threat from exposure to infected wildlife carcasses.

Threatened and Endangered Species and Critical Habitat

Section 7 of the Endangered Species Act (16 U.S.C. §§1531-1544) and its implementing regulations require federal agencies to ensure that their actions are not likely to jeopardize the continued existence of threatened or endangered (listed) species or result in the destruction or adverse modification of critical habitat. USDA APHIS VS considered the potential effects of its actions under both alternatives on threatened and endangered species and designated critical habitat. Federally listed species in the seven states are given in Table 3.

The proposed action includes disease monitoring and surveillance of poultry, depopulation, transport, carcass management, and cleaning and disinfection. Disease monitoring and surveillance by USDA APHIS VS will have no effect on listed species or critical habitat because these activities occur in developed areas with poultry and directly with the poultry where listed species or their habitats generally do not occur. There are no activities associated with surveillance (monitoring and sampling) of domestic poultry that would result in any impacts to listed species. USDA APHIS WS

conducts surveillance and monitoring of wild birds. These activities will not involve threatened or endangered species. WS would complete a Section 7 consultation with the appropriate USFWS Ecological Services field offices for these activities if they are to be used to ensure protection of listed species and their habitats. These activities though, are fairly target-specific and avoid capture of threatened and endangered species, but if a possibility exists, USDA APHIS WS has consulted with USFWS on such activities.

The following sections discuss the impacts of depopulation, transport, carcass management, and disinfection on listed species and critical habitat.

a. Potential Impacts to Federally Listed Species

Depopulation: There are many potential adverse effects to threatened and endangered species from consuming carcasses if they are contaminated with veterinary medications or lead ammunition. However, depopulated HPAI chickens and turkeys are not contaminated with veterinary medications or euthanasia solutions because these are not used, and when lead ammunition is used in air guns (.22 pellets) and rifles (e.g., .22 caliber), carcasses are retrieved. Nontoxic shot is used in the ground use of shotguns. Use of gunshot as a depopulation method is infrequent and typically only used with small numbers of feral or wild backyard flocks minimizing potential chances for impacts to threatened and endangered species. Only captive bolts, cervical dislocation, decapitation, and VSD+, CO_2 or Class A fire-suppression foam (such as Phos-Chek® WD881 Class A Foam Concentrate) is used to depopulate birds inside of commercial poultry houses. If listed species were to ingest euthanized chickens or turkeys depopulated using these methods, there would be no toxic effect because the ingredients are nontoxic (exposure route is inhalation). In addition, there is no run-off of the foam as it dissipates, and the remaining moisture/residue is absorbed by the litter or substrate in the poultry house.

Transport: When carcasses are to be incinerated off-site or are to be landfilled, the carcasses must be transported to those sites. Carcasses to be transported are removed from the poultry houses, placed in lined roll-off containers, and covered with secure tarps prior to transport. No listed species would have access to carcasses during transport. Vehicles used to transport carcasses would only travel on established roadways and driveways and would not enter listed species habitat. Therefore, transport of carcasses by USDA APHIS VS and its cooperators would have no effect on listed species.

Carcass Management: Improper disposal of carcasses could expose listed species to HPAI. All federally listed bird species in the geographic area covered by this EA may be susceptible to HPAI, although susceptibility of different types of birds may be variable. Uncontrolled spread of HPAI in the geographic area covered by this EA may have adverse impacts to threatened and endangered birds, depending on their susceptibility to HPAI. However, it is most likely that listed birds would be exposed to HPAI from wild, migratory birds as the viruses commonly circulate in the flyways (Bouwstra et al. 2017), and the HPAI emergency response activities in this EA only cover domestic poultry. In addition, no listed bird species in the geographic area covered by this EA would be expected to scavenge on diseased carcasses, except eagles which were addressed separately. Listed

birds in the geographic area covered by this EA are mainly shorebirds or marsh-inhabiting species and would not be exposed to diseased carcasses. The whooping crane is occasionally present in Michigan, and these birds would not scavenge on carcasses.

Indoor composting, rendering, alkaline hydrolysis, and incineration of carcasses will preclude any contact between listed species and carcasses because the carcasses are contained within barns or in containers. Onsite burial, outdoor composting, and landfilling could potentially expose listed species to carcasses if they are left uncovered. However, landfilled and buried carcasses are covered with several feet of soil or other material, and composted carcasses are covered with 8 to 12 inches of clean material such as wood chips. Covering the carcasses with soil or other material will prevent listed species from accessing them. In addition, for onsite burial and composting, sites selected will likely be previously disturbed cropland areas, not undisturbed areas that could serve as habitat for listed species.

Cleaning and disinfection: There are many commercial products available that may be used to disinfect vehicles, PPE, equipment, supplies, and buildings. Within poultry premises, areas or equipment that may require disinfection include egg processing equipment such as egg belts, flats, buggies, and packing machines; nesting boxes; and egg storage rooms. Production facilities may also consist of open floor areas which require removal of litter and manure prior to disinfection efforts. It is the applicator's responsibility to ensure that the product is approved for HPAI and for the intended use site. Federally listed species will not be exposed to these antimicrobial products because used disinfectant containment must occur, as indicated by USDA APHIS VS guidelines (USDA APHIS 2014b) and the specific product label; thus, USDA APHIS VS and its cooperators would follow labels for the use of disinfectants, and many do not allow their use around water bodies that could be contaminated by runoff. Therefore, there would be no effect on listed species from exposure to HPAI disinfectants.

b. Impacts to Critical Habitat

Critical habitat consists of specific geographic areas that contain features essential to the conservation of an endangered or threatened species and that may require special management and protection. Critical habitat may also include areas that are not currently occupied by the species but will be needed for its recovery. Critical habitat contains physical or biological features needed for life processes such as:

- Space for individual and population growth and for normal behavior;
- Cover or shelter;
- Food, water, air, light, minerals, or other nutritional or physiological requirements;
- Sites for breeding and rearing offspring; and
- Habitats that are protected from disturbances or are representative of the historical geographical and ecological distributions of a species (USFWS 2017).

Incineration, landfilling, rendering, and alkaline hydrolysis would have no effect on designated critical habitat because this would involve disposing of carcasses in already existing facilities or

containers, thus not modifying critical habitat. However, placement of outdoor burial or compost sites could adversely modify the critical habitat of a listed species if it unfavorably affects the critical habitat's physical and biological features that benefit the species. The disturbance and habitat alteration from onsite carcass burial or outdoor composting could cause adverse effects to critical habitat. However, USDA APHIS VS or its cooperators will not compost or bury carcasses within the proposed or designated critical habitat of listed species. Outdoor composting or burial would occur in developed farm fields, which are generally not critical habitat for listed species. If a listed species is in a given area, USFWS will be requested to provide maps to ensure critical habitat will not be altered (most areas will be developed upland habitat with minimal chance of being critical habitat).

Table 3. Federally-listed species within the program area.

Taxon	Common Name #	Scientific Name	Listing Status*	Critical Habitat**	EA States of Occurrence
Mammal	Canada lynx	*Lynx canadensis*	T	Yes	ME, MI
Mammal	Carolina northern flying squirrel	*Glaucomys sabrinus coloratus*	E	No	VA
Mammal	Gray bat	*Myotis grisecens*	E	No	IN, KY, VA
Mammal	Indiana bat	*Myotis sodalis*	E	Yes	IN, KY, MI. NY, VA
Mammal	Northern long-eared bat	*Myotis septentrionalis*	T	No	DE, IN, KY, ME, MI, NY, VA
Mammal	Virginia big-eared bat	*Corynorhinus (=Plecotus) townsendii virginianus*	E	Yes	KY, VA
Bird	Eastern black rail	*Laterallus jamaicensis* ssp. *jamaicensis*	T	No	DE, IN, VA
Bird	Piping plover (Atlantic Coast and Northern Great Plains DPSs)	*Charadrius melodus*	T	Yes	DE, ME, NY, VA
Bird	Piping plover (Great Lakes Watershed DPS)	*Charadrius melodus*	E	Yes	IN, NY, MI
Bird	Red-cockaded woodpecker	*Picoides borealis*	E	No	VA
Bird	Red knot	*Calidiris canutus rufa*	T	No (PCH)	DE, IN, ME, MI, NY, VA
Bird	Roseate tern	*Sterna dougallii dougallii*	E	No	DE, ME, NY, VA
Bird	Whooping crane	*Grus americana*	EXPN	No	MI
Fish	Atlantic salmon (Gulf of Maine DPS)	*Salmo salar*	E	Yes	ME
Fish	Atlantic sturgeon (Carolina, Chesapeake Bay, and NY Bight DPSs)	*Acipenser oxyrinchus oxyrinchus*	T	Yes	DE, ME, NY, VA
Fish	Blackside dace	*Phoxinus cumberlandensis*	T	No	KY, VA
Fish	Candy darter	*Etheostoma osburni*	E	Yes	VA
Fish	Cumberland darter	*Etheostoma susanae*	E	Yes	KY
Fish	Duskytail darter	*Etheostoma percnurum*	E	No	KY, VA
Fish	Kentucky arrow darter	*Etheostoma spilotum*	T	Yes	KY
Fish	Palezone shiner	*Notropis albizonatus*	E	No	KY
Fish	Pallid sturgeon	*Notropis albizonatus*	E	No	KY
Fish	Relict darter	*Etheostoma chienense*	E	No	KY
Fish	Roanoke logperch	*Percina rex*	E	No	VA

Taxon	Common Name #	Scientific Name	Listing Status*	Critical Habitat**	EA States of Occurrence
Fish	Shortnose sturgeon (Northern, Mid-Atlantic, and Southern DPSs)	*Acipenser brevirostrum*	E	No	DE, ME, NY, VA
Fish	Slender chub	*Erimystax cahni*	T	Yes	VA
Fish	Spotfin chub	*Erimonax monachus*	T	Yes	VA
Fish	Yellowfin madtom	*Noturus flavipinnis*	T	Yes	VA
Fish	Yellowfin madtom	*Noturus flavipinnis*	EXPN	Yes	VA
Reptile	Bog turtle	*Glyptemys muhlenbergii*	T	No	DE, NY
Reptile	Copperbelly water snake	*Nerodia erythrogaster neglecta*	T	No	IN, MI
Reptile	Eastern massasauga	*Sistrurus catenatus*	T	No	IN, MI, NY
Reptile	Green sea turtle (North Atlantic DPS)	*Chelonia mydas*	T	Yes	VA
Reptile	Hawksbill sea turtle	*Eretmochelys imbricata*	E	Yes	VA
Reptile	Kemp's ridley sea turtle	*Lepidochelys kempii*	E	No (PCH)	VA
Reptile	Leatherback sea turtle	*Dermochelys coriacea*	E	Yes	VA
Reptile	Loggerhead sea turtle (Northwest Atlantic DPS)	*Caretta caretta*	T	Yes	VA
Amphibian	Shenandoah salamander	*Plethodon shenandoah*	E	No	VA
Mussel	Appalachian monkeyface (pearlymussel)	*Quadrula sparsa*	E	No	VA
Mussel	Atlantic pigtoe	*Fusconaia masoni*	T	Yes	VA
Mussel	Birdwing pearlymussel	*Lemiox rimosus*	E	No	VA
Mussel	Clubshell	*Pleurobema clava*	E	No	IN, KY, MI, NY
Mussel	Cracking pearlymussel	*Hemistena lata*	E	No	VA
Mussel	Cumberland bean	*Villosa trabalis*	E	No	KY, VA
Mussel	Cumberland elktoe	*Alasmidonta atropurpurea*	E	Yes	KY
Mussel	Cumberland monkeyface (pearlymussel)	*Quadrula intermedia*	E	No	VA
Mussel	Cumberlandian combshell	*Epioblasma brevidens*	E	Yes	KY, VA
Mussel	Dromedary pearlymussel	*Dromus dromas*	E	No	KY, VA
Mussel	Dwarf wedgemussel	*Alasmidonta heterodon*	E	No	NY, VA
Mussel	Fanshell	*Cyprogenia stegaria*	E	No	IN, KY, VA
Mussel	Fat pocketbook	*Potamilus capax*	E	No	IN, KY
Mussel	Finerayed pigtoe	*Fusconaia cuneolus*	E	No	VA
Mussel	Fluted kidneyshell	*Ptychobranchus subtentus*	E	Yes	KY, VA
Mussel	Green blossom (pearlymussel)	*Epioblasma torulosa gubernaculum*	E	No	VA
Mussel	James spinymussel	*Pleurobema collina*	E	No	VA
Mussel	Littlewing pearlymussel	*Pegias fabula*	E	No	KY, VA
Mussel	Longsolid	*Fusconaia subrotunda*	PT	No (PCH)	NY
Mussel	Northern rifflesheIl	*Epioblasma torulosa rangiana*	E	No	IN, KY, MI, NY
Mussel	Orangefoot pimpleback (pearlymussel)	*Plethobasus cooperianus*	E	No	KY
Mussel	Oyster mussel	*Epioblasma capsaeformis*	E	Yes	KY, VA
Mussel	Pink mucket (pearlymussel)	*Lampsilis abrupta*	E	No	IN, KY, VA
Mussel	Purple bean	*Villosa perpurpurea*	E	Yes	VA
Mussel	Purple cat's paw	*Epioblasma obliquata obliquata*	E	No	KY
Mussel	Rabbitsfoot	*Quadrula cylindrica cylindrica*	T	Yes	IN, KY

Taxon	Common Name #	Scientific Name	Listing Status*	Critical Habitat**	EA States of Occurrence
Mussel	Rayed bean	*Villosa fabalis*	E	No	IN, MI, NY
Mussel	Ring pink (mussel)	*Obovaria retusa*	E	No	KY
Mussel	Rough pigtoe	*Pleurobema plenum*	E	No	IN, KY
Mussel	Round hickorynut	*Obovaria subrotunda*	PT	No (PCH)	IN, VA
Mussel	Rough rabbitsfoot	*Quadrula cylindrica strigillata*	E	Yes	VA
Mussel	Sheepnose mussel	*Plethobasus cyphyus*	E	No	IN, KY, VA
Mussel	Shiny pigtoe	*Fusconaia cor*	E	No	VA
Mussel	Slabside pearlymussel	*Pleuronaia dolabelloides*	E	Yes	VA
Mussel	Snuffbox mussel	*Epioblasma triquetra*	E	No	IN, KY, MI, VA
Mussel	Spectaclecase (mussel)	*Cumberlandia monodonta*	E	No	KY, VA
Mussel	Tan riffleshell	*Epioblasma florentina walkeri*	E	No	KY, VA
Mussel	White catspaw	*Epioblasma obliquata perobliqua*	E	No	IN
Mussel	Yellow lance	*Elliptio lanceolata*	T	Yes	VA
Snail	Chittenango ovate amber snail	*Novisuccinea chittenangoensis*	T	No	NY
Snail	Virginia fringed mountain snail	*Polygyriscus virginianus*	E	No	VA
Insect	Hine's emerald dargonfly	*Somatochlora hineana*	E	Yes	MI
Insect	Hungerford's crawling water beetle	*Brychius hungerfordi*	E	No	MI
Insect	Karner blue butterfly	*Lycaeides melissa samuelis*	E	No (PCH)	IN, MI, NY
Insect	Northeastern beach tiger beetle	*Habroscelimorpha dorsalis dorsalis*	T	No	VA
Insect	Mitchell's satyr butterfly	*Neonympha mitchellii mitchellii*	E	No	IN, MI, VA
Insect	Poweshiek skipperling	*Oarisma poweshiek*	E	Yes	MI
Insect	Rusty-patched bumble bee	*Bombus affinis*	E	No	IN, ME, VA
Crustacean	Big Sandy crayfish	*Cambarus callainus*	T	No (PCH)	KY, VA
Crustacean	Kentucky cave shrimp	*Palaemonias ganteri*	E	Yes	KY
Crustacean	Lee County Cave isopod	*Lirceus usdagalun*	E	No	VA
Crustacean	Madison Cave isopod	*Antrolana lira*	T	No	VA
Arachnid	Spruce-fir moss spider	*Habroscelimorpha dorsalis dorsalis*	E	Yes	VA
Plant	American hart's-tongue fern	*Asplenium scolopendrium var. americanum*	T	No	MI, NY
Plant	Braun's rock-cress	*Arabis perstellata*	E	Yes	KY
Plant	Canby's dropwort	*Oxypolis canbyi*	E	No	DE
Plant	Cumberland rosemary	*Conradina verticillata*	T	No	KY
Plant	Dwarf lake iris	*Iris lacustris*	T	No	MI
Plant	Eastern prairie fringed orchid	*Platanthera leucophaea*	T	No	IN, ME, MI, VA
Plant	Furbish lousewort	*Pedicularis furbishiae*	E	No	ME
Plant	Harperella	*Ptilimnium nodosum*	E	No	VA
Plant	Houghton's goldenrod	*Solidago houghtonii*	T	No	MI, NY
Plant	Kentucky glade-cress	*Leavenworthia exigua laciniata*	T	Yes	KY
Plant	Lakeside daisy	*Hymenoxys herbacea*	T	No	MI
Plant	Leedy's roseroot	*Rhodiola integrifolia* ssp. *leedyi*	T	No	NY
Plant	Mead's milkweed	*Asclepias meadii*	T	No	IN

Taxon	Common Name #	Scientific Name	Listing Status*	Critical Habitat**	EA States of Occurrence
Plant	Michaux's sumac	*Rhus michauxii*	E	No	VA
Plant	Michigan monkey-flower	*Mimulus michiganensis*	E	No	MI
Plant	Northeastern bulrush	*Scirpus ancistrochaetus*	E	No	VA
Plant	Peter's mountain mallow	*Iliamna corei*	E	No	VA
Plant	Pitcher's thistle	*Cirsium pitcheri*	T	No	IN, MI
Plant	Price's potato-bean	*Apios priceana*	T	No	KY
Plant	Roan Mountain bluet	*Hedyotis purpurea* var. *montana*	E	No	VA
Plant	Seabeach amaranth	*Amaranthus pumilus*	T	No	DE, VA
Plant	Sensitive joint-vetch	*Aeschynomene virginica*	T	No	VA
Plant	Shale barren rock-cress	*Boechera serotina*	E	No	VA
Plant	Short's bladderpod	*Solidago shortii*	E	No	IN, KY
Plant	Small-anthered bittercress	*Cardamine micranthera*	E	No	VA
Plant	Small whorled pogonia	*Isotria medeoloides*	T	No	ME, VA
Plant	Smooth coneflower	*Echinacea laevigata*	E	No	VA
Plant	Spreading avens	*Geum radiatum*	E	No	VA
Plant	Swamp pink	*Helonias bullata*	T	No	DE, VA
Plant	Virginia round-leaf birch	*Betula uber*	T	No	VA
Plant	Virginia sneezeweed	*Helenium virginicum*	T	No	IN, VA
Plant	Virginia spiraea	*Spiraea virginiana*	T	No	KY, VA
Plant	White fringeless orchid	*Platanthera integrilabia*	T	No	KY
Lichen	Rock gnome lichen	*Gymnoderma lineare*	E	No	VA

*E=endangered, T=threatened, PE=proposed endangered, PT=proposed threatened, EXPN=nonessential, experimental population.
**PCH=proposed critical habitat.
Abbreviations: DE – Delaware; DPS - Distinct population segment; IN – Indiana; KY – Kentucky; ME – Maine; MI – Michigan; NY – New York; VA – Virginia.
Source: (USFWS IpaC 2022)

3.2.4.2 Potential Impacts: No Action Alternative

Under the No Action Alternative, USDA APHIS VS would provide minimal support, just technical assistance with most activities associated with depopulation, disposal, disinfection, and transportation to off-site facilities if needed. Either a State or USDA APHIS VS Official would be present for depopulation to ensure that it is completed. USDA APHIS VS would conduct surveillance, environmental sampling, approve indemnity for depopulation, disposal, and cleaning and disinfection. The State would allow quarantine release after it determined that HPAI was stamped out. USDA APHIS VS, providing minimal technical support and no field assistance, would have no effect on wildlife populations. Transportation of poultry carcasses is not likely to further expose wildlife to avian diseases because carcasses that are transported off-site are moved on trucks in a controlled manner that mitigates the risk of spreading diseases. Each truck carrying infected carcasses would follow state requirements and be issued a USDA permit to move outside of the quarantine zone (USDA APHIS 2015b; 2015a). In addition, USDA APHIS VS employs several layers of safety measures and carefully monitors all cleanup and disposal activities to ensure that they are done in compliance with USDA protocols.

3.2.4.3 Potential Impacts: Proposed Action Alternative

NEPA requires U.S. federal agencies to examine the reasonably foreseeable effects of a proposed actions on the human environment (40 CFR 1508.1(g)). Under the Proposed Action Alternative, surveillance, quarantine, environmental sampling, depopulation, disposal, disinfection, and quarantine release of poultry houses and backyard flocks will have no effect on wildlife populations following standard protocols for personnel conducting HPAI stamp out activities, keeping poultry disease free, biosecurity, and disinfecting areas to minimize spread of HPAI (USDA APHIS 2016f; 2017e; 2020c; 2022c; 2022d). Transportation of poultry carcasses is not likely to further expose wildlife to avian diseases because carcasses that are transported off-site are moved on trucks in a controlled manner that mitigates the risk of spreading diseases. Each truck carrying infected carcasses would follow state requirements and be issued a USDA permit to move outside of the quarantine zone (USDA APHIS 2015b; 2015a). In addition, USDA APHIS VS employs several layers of redundant safety measures and carefully monitors all cleanup and disposal activities to ensure that they are done in compliance with USDA protocols (USDA APHIS 2022d; 2022c). If the assistance of USDA APHIS VS inhibits further outbreaks of HPAI from additional personnel helping with an incident, it is possible that a few wild birds may benefit from not being exposed to HPAI.

3.2.5 Other Considerations

This section considers potential environmental impacts as they may relate to minority, low-income, and disadvantaged communities; sensitive populations such as children; historic and cultural resources; and Tribal interactions.

Federal agencies are required to identify and address disproportionately high and adverse human health or environmental impacts of their proposed activities. The following executive orders (EOs) require consideration of the potential impacts of federal actions on human health, cultural resources, wildlife, and the environment.

EO 12898 – Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations: This EO requires federal agencies to conduct their programs, policies, and activities that substantially affect human health or the environment in a manner so as not to exclude persons and populations from participation in or benefiting from such programs. It also enforces existing statutes to prevent minority and low-income communities from being subjected to disproportionately high and adverse human health or environmental effects.

EO 13985 – Executive Order on Advancing Racial Equity and Support for Underserved Communities Through the Federal Government: This EO requires federal agencies to advance equity for all, including people of color and others who have been historically underserved, marginalized, and adversely affected by persistent poverty and inequality. Because advancing equity requires a systematic approach to embedding fairness in decision-making processes, executive departments and agencies are required to recognize and work to

redress inequities in their policies and programs that serve as barriers to equal opportunity. Consistent with these aims, each agency must assess whether, and to what extent, its programs and policies perpetuate systemic barriers to opportunities and benefits for people of color and other underserved groups. Such assessments will better equip agencies to develop policies and programs that deliver resources and benefits equitably to all.

EO 13045 – **Protection of Children from Environmental Health Risks and Safety Risks:** Children may suffer disproportionately from environmental health and safety risks due to their developmental stage, higher metabolic rates, and behavior patterns, as compared to adults. This EO requires each federal agency to identify, assess, and address the potential environmental health and safety risks that may disproportionately affect children.

EO 13175 – Consultation and Coordination with Indian Tribal Governments: Executive departments and agencies are charged with engaging in consultation and collaboration with Tribal governments; strengthening the government-to-government relationship between the United States and tribes; and reducing the imposition of unfunded mandates upon Indian tribes. The EO emphasizes that federal agencies will communicate and collaborate with Tribal officials when proposed federal actions have potential Tribal implications. All Tribes that contact USDA APHIS VS will be assisted if they have an HPAI outbreak. Some of the carcass management options may require consultation with Tribal Historic Preservation Officers to determine the best options for a disposal site. If USDA APHIS VS finds any Native American sites or if artifacts are unearthed during composting or burial activities, the appropriate individuals will be notified.

Poultry production operations affected by HPAI are commonly located in rural areas. There may be underserved, minority, or low-income populations in areas close to HPAI-affected large commercial poultry facilities (USDA NASS 2021). Table C-1 (Appendix C) shows the percent of residents living at poverty level and that speak a language other than English at home in each of the counties in the seven states where HPAI outbreaks occurred as of February 24, 2022.[13] Also, backyard poultry producers may be among minority and lower-income populations. Backyard poultry producers are classified as having small flocks with 10 to 50 chickens and produce eggs and meat for the family (Perry et al. 1999). There are no registration requirements for small flocks (AVMA 2019). Backyard poultry flocks are of concern due to their increased exposure potential to wild birds (Pepin et al. 2014; Brown and Bevins 2017). USDA APHIS VS provides free tools and resources to poultry flock owners promoting awareness about the importance of biosecurity and ways to prevent the spread of infectious poultry diseases through its online Defend the Flock education program.[14] The resource center offers biosecurity educational materials, including guides and checklists, in English, Spanish, Chinese, Vietnamese, and Tagalog. Videos, webinars, and

[13] Demographic data on counties where additional outbreaks have occurred since February 24, 2022, will be presented in the Supplemental NEPA document being prepared by USDA APHIS VS.

[14] The USDA APHIS Defend the Flock Program website: USDA APHIS | Defend the Flock Program

graphics on poultry health and diseases, including AI, and biosecurity are available in English and Spanish.

The final determination to depopulate all birds or only specific poultry barns on infected premises or depopulate contact premises is made by State animal health officers, Tribal officials, and owners. Indemnity for depopulated poultry and eggs is authorized by USDA APHIS (2017e) as funds are available. Indemnity payments are to encourage disease reporting, reduce the spread of animal disease, and compensate owners based on fair market value during an HPAI outbreak. Small flocks of poultry, especially laying hens, can be a continual source of food for underserved, minority, or low-income populations. For these small flock owners, especially those that may rely on poultry for food, indemnity will likely aid in their recovery. When HPAI has been confirmed on a premises, a USDA APHIS case manager is assigned to the owner and will be the liaison with USDA APHIS VS throughout the entire process. The case manager will be able to assist any small flock owners that may need help navigating the indemnity process. While USDA APHIS VS provides indemnity payments that can cover the value of birds and eggs, and the cost of depopulation, disposal, cleanup, and disinfection activities, the loss of income or production during downtime or other business disruptions due to HPAI is not covered (USDA APHIS 2017d).

Both alternatives evaluated in this EA are not expected to have any disproportionate adverse impacts on underserved, minority, low-income populations, or children because HPAI outbreaks occur randomly and could occur anywhere. No matter the site, USDA APHIS VS and state partners would be available to help stamp out HPAI. Depopulation of an HPAI-infected flock may have the greatest potential to impact food-insecure populations that rely on poultry for food, as they may have less food while they waited to be released out of the quarantine and start over with a new flock. As it may take a few months to get a flock restarted to where it provides sustenance, this community would need a much more rapid response. Low-income populations living in the area may work at poultry production facilities impacted by HPAI and may lose wages while HPAI response activities occur, and they wait for production to restart.

As explained in Section 3.2.3, Risks to Human Health, human-to-human transmission of HPAI strains is very rare, limited, and not sustained (CDC 2015b), so there are no expected adverse impacts to the health of underserved, minority, low-income populations, or children from HPAI outbreaks. Additionally, the proper handling and cooking of poultry and eggs to an internal temperature of 165˚F kills bacteria and viruses.

Neither alternative poses a risk of disproportionately high and adverse effects to children because they are not likely to be exposed to program actions. USDA APHIS VS actions would not occur when children are present in the immediate area and would not occur on, in, or near school properties. In general, USDA APHIS VS expects there would be a negligible level of exposure of school children to program actions because impacts would occur only when the children walk or travel by a quarantined farm, which is a very short duration of exposure. Children residing on a quarantined farm are more likely to be exposed to the sights, smells, and emotional impacts associated with control actions. However, poultry production facilities tend to not be adjacent to

farm residences or in backyard play areas. If quarantined facilities appear to be near play areas, access would be restricted in order to discourage non-biosecure activities.

As a supplement to the 2017 Census of Agriculture, a report was published with agricultural operation and producer data for 73 selected American Indian reservations (USDA NASS 2019). For each selected reservation, the data included the total number of farms and the number of farms operated by American Indians or Alaska natives with layers inventory and broiler and other meat-type chickens sold. The layers inventory included table-egg type layers, hatching layers for meat-types, hatching layers for table egg types, and reported bantams. Most reporting farms had layers and very few broilers and other chickens. None of the reservations included in this census document are located in the seven states being focused on in this EA but would likely have the same types of poultry operations/flocks.

The USDA Office of Tribal Relations (OTR) works with tribes, tribal organizations, and tribal citizens to ensure access to USDA programs and services and enhance delivery methods through various approaches to improve the coordination and effectiveness of federal programs, services, and actions affecting tribes, tribal organizations, and tribal citizens. USDA APHIS Office of National Tribal Liaison (ONTL) works with Tribal partners and Native American communities to help protect livestock and crops from disease, pests, and wildlife damage.[15] During this HPAI outbreak, USDA APHIS ONTL has sent notifications to more than 5,200 tribal contacts with each new state affected by an HPAI outbreak. In February 2022, the office hosted an AI webinar for tribes to discuss tribal assistance during the 2022 AI Pathway Surveillance Program and provided an update on the status of the HPAI outbreak.

HPAI response activities are not expected to adversely affect Tribal entities. As reviewed in this EA, there are no significant risks to human health and welfare associated with HPAI outbreak and control efforts (see Section 3.2.3, Risks to Human Health). Tribal entities are recognized as independent governments and any HPAI control activities on Tribal lands would be conducted in cooperation with the Tribe. USDA APHIS VS would rely on the owner or operator of the farm to self-identify as a member of a Tribe, and/or identify Tribal interests pertinent to the land. APHIS actions on Tribal lands would occur only if the affected poultry production operation is located on Tribal land and the pertinent Tribal authorities (such as the Tribal Historic Preservation Officer) participate in the process. APHIS expects Tribal members with infected flocks would be directly affected by program activities. Individual Tribal members would be equally impacted in comparison to other individuals in the area because USDA APHIS VS program activities affect all quarantined poultry. Thus far, no Tribes have been involved in the current outbreak, but ONTL has provided outreach to all Tribes, including those in affected states.

The National Historic Preservation Act of 1966, as amended (16 U.S.C. 470 et seq.), requires federal agencies to consider the impact on properties included or eligible for inclusion in the National Register of Historic Places (36 CFR 63, 800). HPAI outbreak response activities do not

[15] USDA Office of Tribal Relations webpage: https://www.usda.gov/tribalrelations. USDA APHIS Office of National Tribal Liaison webpage: https://www.aphis.usda.gov/aphis/ourfocus/tribalrelations.

have the potential to cause long-term visual, atmospheric, or audible changes that would result in effects on the character or use of historic properties based on the nature and types of activities occurring on privately owned poultry production property. Registered historic properties may be near poultry production locations, but they are likely to be historically important battlefields, farmsteads, homesteads, and other sites where carcass burial or composting would not occur.

The HPAI response activities do not have the potential to cause long-term visual, atmospheric, or audible effects that would impair the character or use of historic properties. Registered historic properties may be near poultry production locations, and HPAI stamp out activities could be associated with short-term visual (dust), olfactory (offensive odors), or audible (noise) elements that would impact people in the area of the historic properties depending on the distance between the historic site and the private poultry-producing land. The closer the location to the affected farm, the greater likelihood of negative impacts. These impacts are expected to be short-term in duration, and people can easily avoid them by either going indoors or leaving the area. In addition, most states have laws that have setbacks for such activities (burials, composting) to minimize spill-over to other properties. Intermittent and ephemeral dust, bad smells, and noise from the burial activities will not alter or change the character or use of historic properties. These impacts will cease when the emergency action ends. States and poultry owners under this alternative would be responsible for ensuring that carcass management is correctly done and that the necessary State Historic Preservation Office are contacted if any historic properties may be affected by HPAI response activities.

3.3 Potential Cumulative Impacts

Cumulative environmental impacts encompass effects resulting from the incremental impact of the actions, when added to other past, present, and reasonably foreseeable future actions, and results from individually minor but collectively significant actions taking place over a period of time. With HPAI, thus far, activities associated with stamping out HPAI have been spaced out over time and more random in that they occur in new areas, for the most part. By the time an action comes around again, it is likely that impacts from actions from disposal such as burial, composting, and incineration have been absorbed by the environment and would be starting from scratch. If HPAI outbreaks become an annual event, local impacts may be possible, but still not likely because managed carcasses should have disappeared.

USDA APHIS VS uses a surveillance strategy to maintain a national disease-free designation for U.S. domestic poultry and define areas where risks are located. Surveillance is a critical component of how the disease detection programs find new cases of infection that may be transmitted among flocks, between poultry and wildlife, or introduced from imports into the United States. Surveillance would be conducted under both the No Action and Proposed Alternatives and would not cause cumulative impacts.

Many additional factors work in combination with surveillance programs, such as import regulation requirements, that would limit the potential for cumulative impacts associated with the Preferred

Alternative. The United States does not import live poultry from countries or regions currently experiencing HPAI outbreaks in commercial or backyard poultry flocks. However, USDA APHIS may recognize HPAI-free regions (also called zones) for trade in countries affected by HPAI that demonstrate adequate veterinary infrastructure and authority, movement, disease control measures, and surveillance activities for HPAI (USDA APHIS 2017e).

In response to disease outbreaks, disease eradication activities involving quarantines and expenditures associated with testing for and containing disease are highly likely to reduce the potential for cumulative impacts, such as economic impacts on poultry producers and poultry-based commodities. Effective surveillance and disease controls in the zones or regions of origin ensure imported poultry and poultry products remain free of disease, which in turn, greatly diminishes the risk of infecting additional poultry and wildlife in the United States.

Routine activities that may impact soil, air, and water quality include year-round application of excess manure containing nutrients and chemicals on farmland (Halden and Schwab 2008; Hribar 2010). Reasonably foreseeable cumulative effects could significantly impact the environment when HPAI adaptive management activities become combined with these routine activities on a farm or at poultry production facilities, and/or other governmental activities. To minimize the potential for these types of impacts on the environment, the selection of depopulation and disposal methods and cleaning and disinfection methods must take into consideration other actions that have taken place or will take place on a site. Careful consideration and selection of depopulation and disposal methods, and cleaning and disinfection methods, would allow the reduction of potential cumulative effects on soil, air, and water quality, so that they remain below a level of significance.

Routine cleaning and disinfection already occur inside poultry houses. Over time, the specific disinfectants and the amounts used may change as new products become available and registered for use. Disinfectants are carefully selected and applied by following label instructions to minimize cumulative environmental impacts. On-site composting and burial require the use of proper procedures and mitigation measures to minimize effects to human and wildlife health (USDA APHIS 2017e). Potential cumulative impacts by off-site regulated carcass management activities (e.g., rendering, fixed-facility incineration, and landfill) are expected to be negligible based on the site's compliance with existing regulatory requirements (see Appendix C. Federal and State Regulations for Carcass Movement, in the 2015 Carcass Management EIS (USDA APHIS 2015a).

While specific changes in disease prevalence among the migratory flyways over time cannot be predicted, the potentially impacted area are any poultry production sites. Based on the relative amount of contact with wildlife by poultry populations, we anticipate backyard poultry production along the migratory bird flyways would initially be impacted when disease prevalence increases, or a new strain arises in wildlife populations. Then we would expect disease to occur in poultry houses along the migratory bird flyways. The U.S. surveillance strategy facilitates rapid detection and response to disease occurrence by detecting HPAI in wild birds that are carriers and then being able to focus attention in those general areas with stakeholder and state notifications of the disease. This minimizes the potential for cumulative impacts because USDA APHIS VS could assist more rapidly with stamping out HPAI outbreaks and there would be fewer poultry outbreaks.

Poultry production operations experiencing multiple disease outbreaks have a greater potential for cumulative impacts based of the need to repeatedly devote resources to disease elimination over time. Additionally, providing indemnity to poultry owners incentivizes them to respond immediately to an outbreak in their flock and depopulate, dispose, and disinfect as quickly as possible so that they can return to business as quickly as possible. Following best management practices and enhancing biosecurity measures over the long-term reduces the likelihood of negative cumulative impacts (USDA APHIS 2017b; 2017e). Effective stamping out of the disease at the local level (reducing disease prevalence in the area) and reducing the likelihood of exposure for the next generation of birds also reduces the potential for cumulative environmental impacts.

4 Agencies Contacted

Environmental and Risk Analysis Services
Policy and Program Development
Animal and Plant Health Inspection Service
U.S. Department of Agriculture
4700 River Road, Unit 149
Riverdale, MD 20737

Strategy and Policy
Veterinary Services
Animal and Plant Health Inspection Service
U.S. Department of Agriculture
4700 River Road, Unit 38
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Appendix B. Avian Influenza

Disease Description

HPAI and LPAI is caused by infection with viruses of the family Orthomyxoviridae, in the genus and species *Influenza Virus A*. Influenza A viruses are the only Orthomyxoviruses known to affect birds. Influenza A viruses are classified into subtypes based on their hemagglutinin (H) and neuraminidase (N) antigens.[16] H and N are glycoproteins[17] that protrude from the outer surface of the influenza virus and N specifically encases the virus cell membrane and the viral contents. The hemagglutinin and neuraminidase glycoproteins are important in the ability of the virus to cause influenza. A standard single influenza virus particle contains about 500 molecules of hemagglutinin and 100 molecules of neuraminidase, which are scattered over the surface of the virus. All influenza A virus subtypes can infect birds, except two subtypes which have only been found in bats (CDC 2018).

Hemagglutinin derives its name from the ability of this virus glycoprotein to agglutinate, or clump together, red blood cells. This aggregation compromises the function of the red blood cells. The H glycoprotein also functions to bind the virus to cells, via the recognition of a chemical structure on the cells surface called sialic acid. The binding of H to sialic acid compounds on the surface of cells is the initial event in the association of the virus with epithelial cells. These activities give the H subtypes their infectious ability and the primary virulence (disease-causing) factor of the influenza virus. There are 18 distinct H subtypes (H1-H18) important in animal infections that are encoded by genes in the virus (CDC 2021).

The activity of N disrupts the mucous fluid that is present in the respiratory tract. Neuraminidase, an enzyme, is the common name for acetyl-neuraminyl hydrolase, a glycoprotein compound in a virus that removes residues called N-Acetyl-neuraminic acid from chains of sugars or other glycoproteins. This disruption of the neuraminic acid residues allows the virus to replicate with the copy exiting the cell to enter a new cell to initiate a new round of viral replication. The result of these activities is to ease the spread of the virus through the respiratory tract. Eleven different N types (N1-N11) are found in animal influenza infections (CDC 2021).

Strains of AI viruses have likely been in birds for a long time, especially waterbirds (Olsen et al. 2006; Lang et al. 2016). While HPAI had been seen in domestic birds, the first documented wild bird die-off was in 1961 in South Africa where 1,250 terns (*Sterna* spp.) succumbed to the disease. HPAI became much more of a concern when an outbreak occurred in domestic geese in the Guangdong Province of China (Gs/GD) in 1996, which was designated as A/goose/Guangdong/1/1996 H5N1 virus (Wan 2012).

[16] Antigens are toxins or foreign substances that in the body cause an immune response, primarily the production of antibodies.

[17] A glycoprotein is a protein that contains a short chain of sugar as part of its structure.

HPAI viruses spread rapidly, cause severe disease, and are often fatal to chickens and turkeys, with few birds in an infected flock surviving. The HPAI strains are usually very contagious in poultry with a high mortality rate and can cause devastating losses in commercial flocks while resulting in the need to quarantine and depopulate the remaining stock. In contrast, LPAI usually only causes minor sickness or no noticeable signs of disease and is rarely fatal in wild birds and, thus, is not as much a concern unless LPAI mutates into more virulent forms. Concerns for wild bird populations are increasing with a rise in the frequency of the HPAI (Ramey et al. 2022). The pathogenicity of these bird viruses has no association with the pathogenicity of that same virus in people (Spickler 2016). Thus far in 2022, the highly pathogenic influenza A viruses that produce acute clinical disease in chickens, turkeys, and other birds of economic importance have been associated with only the H5 and H7 subtypes. While most viruses of H5 and H7 subtypes isolated from birds have been of low pathogenicity for poultry, risk of these subtypes mutating or recombining with other AI viruses, creating a strain with greater virulence, is always a concern.

Signs of HPAI infection include coughing, sneezing, sinusitis, blood-tinged oral and nasal discharges, diarrhea, ecchymosis (subcutaneous bleeding) on the legs and feet, and edema and cyanosis of unfeathered skin on the head, comb, and wattle. Egg production drops or ceases, and eggs may become discolored or deformed. Domestic waterfowl tend to be only mildly affected by HPAI, but respiratory signs, diarrhea, corneal opacity, occasional neurological signs, and increased mortality may occasionally be seen (Spickler 2016).

Shedding of the AI virus from infected birds occurs in the feces and respiratory secretions. Viral shedding can begin two to three days after infection and typically continues for about a week in chickens, but individual birds of various species can shed virus particles for several weeks in laboratory experiments. HPAI viruses are typically spread indirectly through fecal-oral transmission and to a lesser extent directly through respiratory routes. Transmission of the virus through broken eggs can occur from viral shedding in the yolk and albumen (egg white). Factors reducing viral survival in the environment include high temperatures and direct exposure to sunlight, while the presence of organic material such as leaf litter and higher relative humidity promote viral persistence (Spickler 2016). Infected aquatic wild birds are considered natural reservoir hosts for LPAI (USDA APHIS 2017e). Three likely outcomes occur when viruses from wild birds transfer to poultry: (1) the viral strain circulates inefficiently and dies out, (2) the strain adapts to the new host and continues to circulate as an LPAI virus, or (3) strains containing H5 or H7 evolve into HPAI viruses. Viral strains adapted to poultry rarely re-establish in wild birds (Spickler 2016), but this could change with disease mutation and evolution (Ramey et al. 2022).

Many domesticated birds other than chickens and turkeys such as game birds, ducks, geese, ratites, pigeons, and cage birds also harbor AI viruses. However, some species are more resistant to infection or illness than others. The majority of LPAI viruses are maintained in asymptomatic wild birds, particularly waterfowl and other waterbirds associated with aquatic habitats (Spickler 2016; USDA APHIS 2017e). AI infections have been occasionally detected in mammals such as cats, dogs, pigs, horses, donkeys, and mink (Spickler 2016).

HPAI viruses can survive in frozen poultry meat produced from infected chickens and ducks for several weeks or more (Ejaz et al. 2007; Harder et al. 2009). Cooking per Food Safety and Inspection Service standards (9 CFR 381.150) is sufficient to kill food-borne AI (Ejaz et al., 2007; USDA FSIS, 2017). AI viruses can be transmitted to other birds through consuming raw internal organs of infected birds in their feed (Harder et al. 2009; Spickler 2016).

Humans can become infected when enough of the AI virus gets into a person's eyes, nose, or mouth, or is inhaled. The spread of these viruses from one person to another has rarely been reported, but when reported, the spread has been limited and not sustained (CDC 2017). HPAI viral infections in humans were associated with a range of symptoms including conjunctivitis, influenza-like illness, and severe respiratory illness with multi-organ disease. Most human illness and deaths were from HPAI H5N1 (CDC 2017). The World Health Organization (WHO 2021) described the risk to humans as low and stated that "[w]henever avian influenza viruses are circulating in poultry, there is a risk for sporadic infection and small clusters of human cases due to exposure to infected poultry or contaminated environments. Therefore, sporadic human cases are not unexpected."

HPAI Occurrence in the United States

Wild birds, particularly migratory waterfowl, can be infected with HPAI and show no signs of illness (USDA APHIS 2022a). Migratory waterbirds, which tend to be reservoirs for HPAI, can distribute HPAI during migration and potentially expose domestic poultry, including commercial and backyard poultry flocks.

Migratory waterfowl tend to travel specific flyways and infected birds are a source of a potential outbreak. As of February 24, 2022, poultry that have been infected by the current outbreak are found in the Atlantic and Mississippi Flyways (discussed below in Description of the Mississippi and Atlantic Flyway). Since that date, HPAI has been detected in all four North American flyways. Additional outbreaks in the four flyways will be discussed in a supplemental NEPA document being prepared by USDA APHIS VS.

Description of the Mississippi and Atlantic Flyways

Migratory Flyways are migratory bird routes managed by the U.S. Fish & Wildlife Service (USFWS) and its partners (see Figure B-1). These routes are largely based on routes certain species of birds follow as they migrate between nesting and wintering areas. Historical observation of bird migratory patterns has established four administrative North American Flyways, i.e., Atlantic, Mississippi, Central, and Pacific, to facilitate the management of migratory birds and their habitats.

Each flyway has an administrative Flyway Council, consisting of representatives from each state, provincial, and territorial agency within that flyway who are advised by technical committees consisting of biological staff from their member agencies. The technical committees evaluate population and habitat information and make recommendations to the Councils on matters of migratory bird conservation.

The Mississippi Flyway covers the states of Alabama, Arkansas, Indiana, Illinois, Iowa, Kentucky, Louisiana, Michigan, Minnesota, Mississippi, Missouri, Ohio, Tennessee, and Wisconsin, along with the Canadian provinces of Saskatchewan, Manitoba, and Ontario. Representatives from the states and provinces are responsible for managing bird resources in the flyway.

The Atlantic Flyway covers the states of Connecticut, Delaware, Florida, Georgia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, North Carolina, Pennsylvania, Rhode Island, South Carolina, Vermont, Virginia, and West Virginia. The Canadian territory of Nunavut, the Canadian provinces of Newfoundland, New Brunswick, Nova Scotia, Ontario, Prince Edward Island, and Quebec, and the U.S. territories of Puerto Rico and the U.S. Virgin Islands also have representation on the Atlantic Flyway council. Representatives from the states and provinces are responsible for managing bird resources in the flyway.

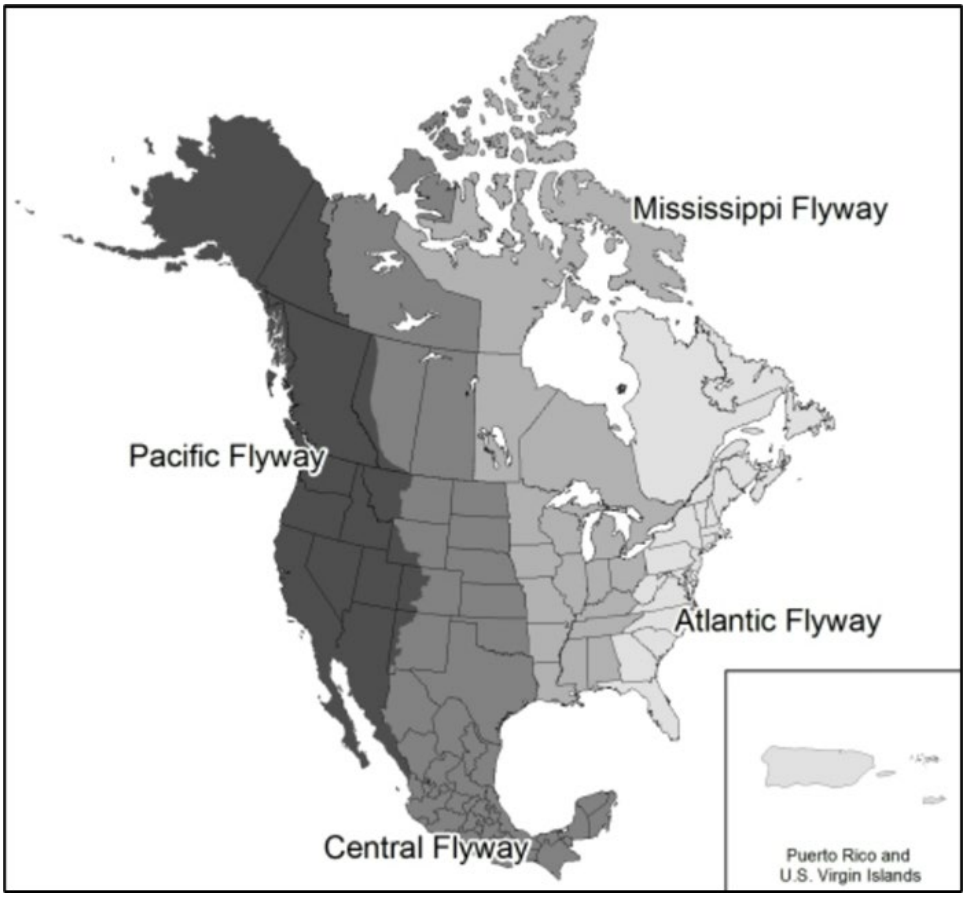

Figure B-1. North American flyways.

Source: (USFWS 2021a)

Surveillance and Disease Monitoring

The United States has the strongest HPAI surveillance program in the world. The APHIS wild bird surveillance program provides an early warning system for the introduction and distribution of avian influenza viruses of concern in the United States, allowing APHIS and the poultry industry to

take timely and rapid action to reduce the risk of spread to our poultry industry and other populations of concern (USDA APHIS 2022a). Through ongoing wild bird surveillance program, USDA APHIS collects and tests large numbers of samples from wild birds in the North American Flyways.

In addition to monitoring for HPAI in wild bird populations, USDA APHIS VS monitors for the virus in commercial and backyard poultry flocks. USDA APHIS WS collects about 20,000-30,000 samples nationally, on an annual basis. This effort gives a good indication of the potential for an HPAI outbreak. More surveillance effort is put into coastal Flyways because HPAI is anticipated in these states and waterfowl from these areas are birds that have the highest potential of intermingling with birds from Eurasia during the breeding season.

USDA APHIS VS works with state and local partners to actively look for AI in commercial poultry operations, live bird markets, and migratory wild bird populations. Minimizing contact between domestic and wild birds is fundamental for preventing infection in U.S. domestic poultry stocks because wild birds can be a reservoir for HPAI.

In general, HPAI can spread rapidly among wild bird populations. As of July 12, 2022, HPAI was confirmed in 2,104 wild birds in 44 states and the District of Columbia (USDA APHIS 2022a). Additionally, HPAI had been detected in 53 commercial and backyard poultry flocks in seven states: Delaware, Indiana, Kentucky, Maine, Michigan, New York, and Virginia (USDA APHIS 2022a).

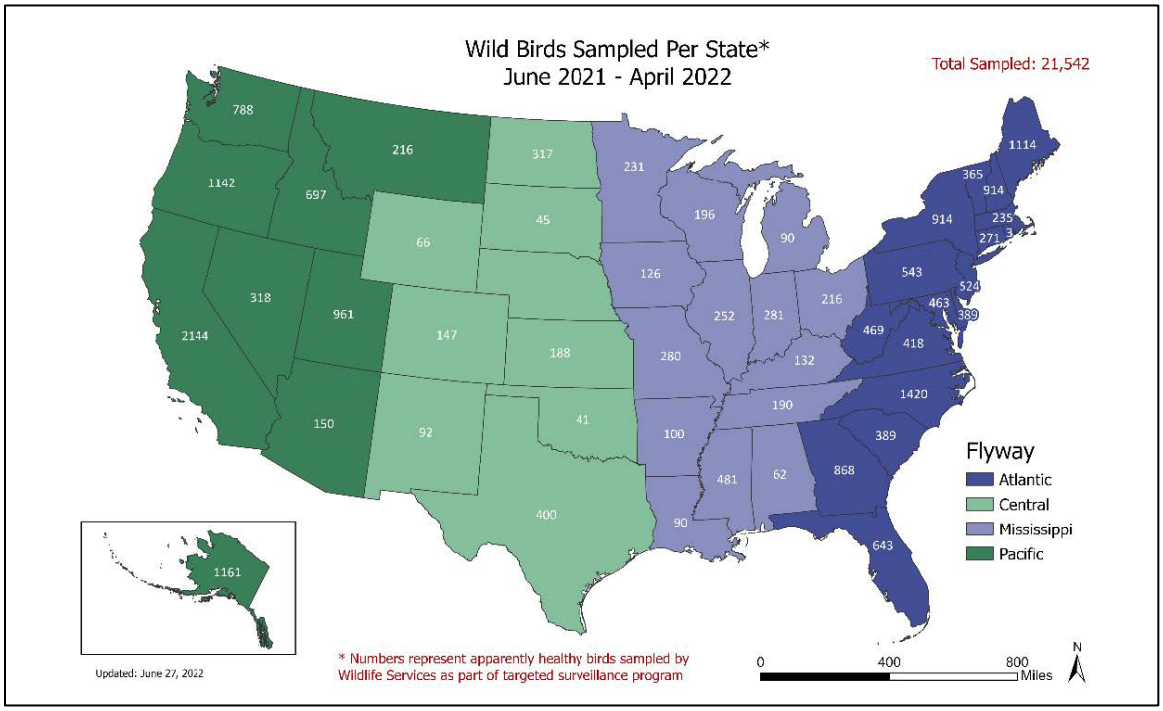

Figure B-2. Wild bird Avian Influenza surveillance: Total birds sampled per state from June 2021 through April 2022.

Appendix C. Descriptions of Counties and States within the Affected Environment

Since environmental impacts could occur where HPAI outbreaks are being stamped out, this appendix focuses on states and counties where HPAI outbreaks could continue to occur.

States with Confirmed Poultry HPAI Detections (as of February 24, 2022)

In the event of future HPAI outbreaks, USDA APHIS VS is proposing to support the efforts of states, tribes, poultry owners, and the poultry industry to eradicate HPAI from infected sites in seven states. Soils in these states vary widely, but are generally composed of gravel, loam, loess, sand, silt, clay, or some amalgamation thereof. Three states border a Great Lake (Indiana, Michigan, New York), one borders the Mississippi River (Kentucky), and the four are along the Eastern seaboard (Delaware, Maine, New York, Virginia). The interior states rely on freshwater supplied by rivers, lakes, aquifers, and rainfall; the eastern seaboard states have both freshwater and saltwater resources.

Air quality in each state varies according to local weather, level of industrial activity, and population density. Poultry slaughtering and processing facilities are in each of the affected states (Figure C-1).

The following sections describe the natural features and industry, common flora and fauna, prior HPAI emergency response action, recent HPAI detection, and demographics and agricultural land use for each of these seven states.

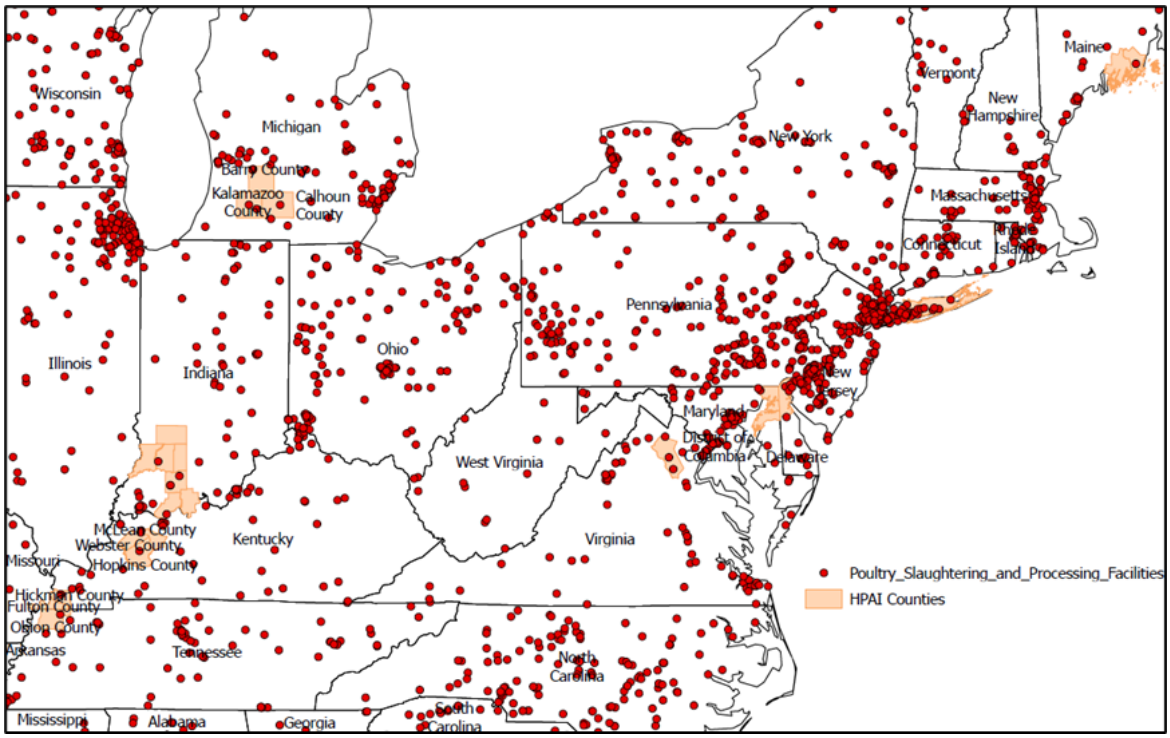

Figure C-1. HPAI affected counties (as of February 24, 2022) and poultry slaughtering and processing facilities, by state.

(Source: USDA APHIS 2022)

Delaware

Natural Features and Industry

Delaware covers 2,057 square miles (mi) (5,328 square kilometers (km)). It is bordered by Maryland on the west and south, New Jersey to the northeast across the Delaware Bay and Delaware River, and Pennsylvania with a short border in the north. The state shares a peninsula with Maryland and Virginia. The area is part of the Atlantic Coastal Plain, which runs for more than 2,200 mi (3,541 km) from Cape Cod to the Gulf of Mexico. The southern part of the state is mostly swampland. Several small rivers flow across the state, either east to the Delaware River and Bay (the Christina and Brandywine Rivers) or west across Maryland into the Chesapeake Bay (the Nanticoke) (EWG n.d.).

The countryside is relatively flat, with the land rising gently from sea level along the eastern shore to 442 feet (ft) along the border with Pennsylvania. Delaware's highest elevation is 447.85 ft above sea level in New Castle County. The state's climate is moderate year-round. Average temperatures range from 75.8°F to 32°F. Annual precipitation is approximately 45 inches. Temperatures along the Atlantic Coast are about 10 degrees warmer in winter and 10 degrees cooler in summer (State of Delaware 2018).

Delaware's finance and insurance sectors have become increasingly important employment and income generators; manufacturing, credit card, banking, and insurance industries are heavily concentrated in the north. Agriculture remains important: broiler chickens, soybeans, corn, and dairy production occupy lands generally below the Chesapeake and Delaware Canal in the south. Potatoes and other vegetables are also grown commercially. Delaware has a small fishing industry centered on harvests of scup (*Stenotomus chrysops*), menhaden (*Brevoortia* spp, *and Ethmidium* spp.), eastern oysters (*Crassosstrea virginica*), and clams (e.g., northern quahog (*Mercenaria mercenaria*) (EWG n.d.). Because Delaware has lenient laws regulating business taxation and practice, the state is home to many of the largest corporations in the United States. This is especially true for those in the banking and financial services sectors; these dominate the state's economy. In addition to chemicals and chemical production (e.g., by the Du Pont corporation), the economy is also supported by the state's biomedical, apparel, processed foods, rubber and plastic products, and transportation equipment industries (State of Delaware 2018).

Common Flora and Fauna

The fauna most likely impacted by HPAI emergency response activities are wild nonmigratory, semi-migratory, and migratory birds in the region. The Audubon Society has prioritized species of birds of conservation concern, which in Delaware that live at least part of the year in the Eastern Forest Biome and Delaware River Basin as defined by the Audubon Society are the red knot (scientific names for birds and mammals discussed in Appendix C are given in Table 76, Western sandpiper, American woodcock, Interior least tern, great cormorant, reddish egret, belted kingfisher, brown-headed nuthatch, wood thrush, yellow-breasted chat, Louisiana waterthrush, prothonotary warbler, black-throated blue warbler, Canada warbler, golden-winged warbler, hooded warbler, cerulean warbler, prairie warbler, yellow warbler, rose-breasted grosbeak, scarlet tanager, and summer tanager, (Michel et al. 2021). Gallinaceous birds similar to poultry in HPAI susceptibility include wild turkeys. Several species of raptors might also be impacted, especially if they were allowed to feed on HPAI infected carcasses, such as the sharp-shinned hawk, Cooper's hawk, red-shouldered hawk, broad-winged hawk, red-tailed hawk, osprey, bald eagle, northern harrier, golden eagle, American kestrel, merlin, peregrine falcon, black vulture, turkey vulture, barn owl, eastern screech-owl, great horned owl, and short-eared owl; many of these species rarely scavenge. Due to possible predation or scavenging of HPAI-infected wildlife, opportunistic mammalian predators such as Virginia opossum, coyotes, red and gray foxes, bobcats, raccoons, striped skunks, and feral and domestic dogs and cats could eat HPAI infected birds but impacts, if any, would depend on the susceptibility of the mammalian predator to the virus and the virus strain; limited data is available on mammals infected with HPAI (Delaware Division Fish Wildlife 2022).

Prior HPAI Emergency Response Actions in Delaware

None by USDA APHIS VS.

Recent HPAI Detections in Delaware

See Table 1 in section 1.2.

Demographics, Agricultural Land Use

See Table C-1.

Indiana

Natural Features and Industry

Indiana encompasses 36,420 square mi (94,327 square km). It is bounded on the north by Lake Michigan and the State of Michigan, on the south by Kentucky, on the east by Ohio, and on the west by Illinois. The state is divided into three physical regions:

To the north, the Great Lakes Plains contain large sand dunes along the shores of Lake Michigan. This landscape varies from flat to gently rolling areas, interspersed with occasional lakes and bogs. The central Till Plain is part of the Midwestern Corn Belt. The soils found in the low hills and valleys produce extremely fertile land. Rugged terrain and steep hills known as knobs are frequent in the Southern Plains and Lowlands. This area is home to several well-known caves and mineral springs (EWG n.d.).

Elevations in Indiana range from 320 ft (97 meters (m)) to 1,257 ft (383 m) above sea level. Bordering Lake Michigan, Indiana lays claim to approximately 230 square mi (595 square km) of this major water source and has a 41-mi (66-mi) shoreline. Some of the major rivers include the Ohio, the Wabash and its tributaries, the White River, the Tippecanoe, and the Kankakee. The state's major lakes include Michigan, Wawasee, and Monroe (EWG n.d.).

Most of Indiana has a humid continental climate: four distinct seasons, with long, warm summers and winters with 10 to 40 inches of snow. Tornadoes often occur in the spring. The southernmost area of the state has a humid subtropical climate, experiencing more frequent rainfall and less extreme temperatures in the winter (EWG n.d.).

As a major industrial center, Indiana specializes in the iron, steel, and oil products industries. Bituminous coal, found mostly in southwestern Indiana, is also a major revenue producer for the state. Manufacturing in Indiana also includes the production of transportation equipment, motor vehicles and equipment, industrial machinery and equipment, electric and electronic equipment, mobile homes, farm machinery, wood office furniture, and pharmaceuticals. The state's major crops are corn, soybeans, wheat, oats, rye, and nursery and greenhouse products. Other successful agricultural activity revolves around the production of tomatoes, onions, popcorn, fruit, hay, tobacco, mint, and livestock. Oak, tulip, beech, and sycamore are the chief products of Indiana's timber/lumber industry (EWG n.d.).

Common Flora and Fauna

The fauna most likely impacted by HPAI emergency response activities are wild nonmigratory, semi-migratory, and migratory birds in the region. The Audubon Society has prioritized species of birds of conservation concern, which in Indiana that live at least part of the year Eastern Forest or Grasslands Biomes as defined by the Audubon Society, are the ruddy duck, northern bobwhite, sandhill crane, black-necked stilt, upland sandpiper, American woodcock, least tern, least bittern, belted kingfisher, wood thrush, yellow-breasted chat, Louisiana waterthrush, black-throated blue warbler, Canada warbler, cerulean warbler, golden-winged warbler, hooded warbler, prairie

warbler, prothonotary warbler, yellow warbler, bobolink, scarlet tanager, summer tanager, and rose-breasted grosbeak, (Michel et al. 2021). Gallinaceous birds, similar to poultry in HPAI susceptibility, include northern bobwhite, ruffed grouse, wild turkey, and ring-necked pheasant. Several species of raptors might also be impacted, especially if they were allowed to feed on HPAI infected carcasses, such as the sharp-shinned hawk, Cooper's hawk, Mississippi kite, red-shouldered hawk, broad-winged hawk, Swainson's hawk, rough-legged hawk, red-tailed hawk, osprey, bald eagle, northern harrier, golden eagle, American kestrel, merlin, peregrine falcon, black vulture, turkey vulture, barn owl, eastern screech-owl, great horned owl, northern saw-whet owl, barred owl, short-eared owl, and long-eared owl; many of these species rarely scavenge. Due to possible predation or scavenging of HPAI-infected wildlife, opportunistic mammalian predators such as Virginia opossum, coyote, red and gray foxes, bobcat, raccoon, striped skunk, American badger, and feral and domestic dog and cat could be exposed to HPAI. Impacts, if any, would depend on the susceptibility of the mammalian predator to the virus, the virus strain, and their potential to spread it; limited data is available on mammals infected with HPAI (DNR 2022).

Prior HPAI Emergency Response Actions in Indiana

December 2014-June 2015: USDA APHIS VS assisted Indiana in outbreak response activities as part of the largest HPAI outbreak ever recorded in the United States. HPAI was confirmed in Indiana after not being detected in the United States for a decade (USDA APHIS 2016a).

January 2016: USDA APHIS VS helped an Indiana county end concurrent outbreaks of HPAI and LPAI in commercial flocks (USDA APHIS 2016b).

Recent HPAI Detections in Indiana

See Table 1 in section 1.2.

Demographics, Agricultural Land Use

See Table C-1.

Kentucky

Natural Features and Industry

The total area of Kentucky is 39,728 square mi
(102,895 square km). It is bounded on the north by the states of Illinois, Indiana, and Ohio, on the south by Tennessee, on the east by Virginia and West Virginia, and on the west by Missouri. The Ohio River runs along the northern boundary of Kentucky, and the Mississippi River runs along the western boundary. The state has five distinct physical regions:

> The Bluegrass Region (sometimes called the Lexington Plain) is characterized by mountains, plateaus, and valleys that are underlain with sandstone, shale, and limestone. Kentucky's Cumberland, Pine, and Black Mountains stand in the Cumberland Plateau. These forested mountain ranges are frequently crossed by gaps and streams.
> The Western Coal Field is a hilly area that lies within the Illinois Basin, extending to the Ohio River on the north and to the Pennyroyal Region on the east, west, and south. It is

named for the large deposits of coal that appear throughout the area. The soil on the borders of the Ohio River is highly fertile.

The Pennyroyal Region, sometimes referred to as the Pennyrile Region for the small herb that grows in the area or, alternately, as the Highland Rim, covers a stretch of land between the southern border of the commonwealth to Kentucky Lake. The southern section of the region contains flat lands interspersed with occasional rolling hills, while the northern section is comprised mostly of rocky ridges containing numerous caves and underground tunnels.

Low hills and flooded plains make up the Jackson Purchase Region, located at Kentucky's western tip. The region extends to Kentucky Lake in the east, the state of Illinois in the north, and to the Mississippi River in the west (EWG n.d.).

Elevations range from 4,139 ft (1,261 m) to 261 ft (79 m) above sea level. Kentucky's major rivers include the Cumberland, Green, Kentucky, Mississippi, and Ohio. Most of Kentucky's lakes were created by damming river waters, such as Barkley Lake, Rough River Lake, Green River Lake, Dewey Lake, and Cumberland Lake. The commonwealth has several sizable waterfalls (EWG n.d.).

Kentucky's climate is temperate; temperatures range from below freezing in the winter to warm and humid in the summer. Annual precipitation is approximately 45 inches. Winter snowfall ranges from 10 to 40 inches. The commonwealth is frequently beset by storms, particularly from March to September (EWG n.d.).

Agriculture dominated Kentucky's economy until the middle of the 20th Century when service industries and manufacturing gained prevalence. Tobacco, hay, corn, soybeans, wheat, fruit, dairy, and livestock are the major products produced by farmers. Other industries include motor vehicles (the state's largest industry), health services, furniture, aluminum ware, brooms, apparel, lumber products, machinery, textiles, and iron and steel products. Kentucky's most important mineral resources are bituminous coal, petroleum, natural gas, stone, sand and gravel, clay, fluorspar, gemstone, limestone, lead, zinc, and fluorite. Coal mines provide 85 percent of the state's mineral income (EWG n.d.).

Common Flora and Fauna

The fauna most likely impacted by HPAI emergency response activities are wild nonmigratory, semi-migratory, and migratory birds in the region. The Audubon Society has prioritized species of birds of conservation concern, which in Kentucky that live at least part of the year in the Eastern Forest or Grasslands Biomes as defined by the Audubon Society, are the ruddy duck, northern bobwhite, sandhill crane, black-necked stilt, upland sandpiper, American woodcock, least tern, least bittern, belted kingfisher, Bell’s vireo, wood thrush, yellow-breasted chat, Louisiana waterthrush, black-throated blue warbler, Canada warbler, cerulean warbler, golden-winged warbler, hooded warbler, prairie warbler, prothonotary warbler, Swainson’s warbler, yellow warbler, western meadowlark, bobolink, scarlet tanager, summer tanager, and rose-breasted grosbeak, (Michel et al. 2021). Gallinaceous birds, similar to poultry in HPAI susceptibility, include northern bobwhite, ruffed grouse, and wild turkeys. Several species of raptors might also be impacted, especially if

they were allowed to feed on HPAI infected carcasses, such as the sharp-shinned hawk, Cooper's hawk, Mississippi kite, red-shouldered hawk, broad-winged hawk, Swainson's hawk, rough-legged hawk, red-tailed hawk, osprey, bald eagle, northern harrier, golden eagle, American kestrel, merlin, peregrine falcon, black vulture, turkey vulture, barn owl, eastern screech-owl, great horned owl, northern saw-whet owl, barred owl, short-eared owl, and long-eared owl; many of these species rarely scavenge. Due to possible predation or scavenging of HPAI-infected wildlife, opportunistic mammalian predators such as Virginia opossum, coyotes, red and gray foxes, bobcats, raccoons, black bears, badger, striped skunks, and feral and domestic dogs and cats could be exposed to HPAI Impacts, if any, would depend on the susceptibility of the mammalian predator to the virus, the virus strain, and their potential to spread it; limited data is available on mammals infected with HPAI (Kentucky Department of Fish Wildlife Resources 2022).

Prior HPAI Emergency Response Actions in Kentucky

December 2014-June 2015: USDA APHIS VS assisted Kentucky in outbreak response activities as part of the largest HPAI outbreak ever recorded in the United States. HPAI was confirmed in the commonwealth after not being detected in the United States for a decade.

Recent HPAI Detections in Kentucky

See Table 1 in section 1.2.

Demographics, Agricultural Land Use

See Table C-1.

Maine

Natural Features and Industry

Maine is bounded to the east and south by the Atlantic Ocean, to the northeast by the Canadian Province of New Brunswick, and to the northwest by the Canadian Province of Quebec. To the west, Maine is bordered by the state of New Hampshire. Receding glaciers left behind thousands of islands, bays, and coves, approximately 3,500 mi (5,632 km) of shoreline. Maine has a low population density—there are 1.3 million inhabitants, most of whom are concentrated in the south. Inland, there are approximately 6,000 lakes and ponds, and there are rugged, mountainous areas to the west. Moosehead Lake is the largest body of water wholly contained by a U.S. state, and Mt. Katahdin (the northern terminus of the Appalachian Trail) is the state's highest peak, at 5,268 ft (1,605 m). Maine typically sees short summers (with warmer weather along the southern beaches and cooler weather inland) and cold winters (EWG n.d.).

Maine's top agricultural commodities are potatoes, dairy products, eggs, seafood, and blueberries. The state is renowned as a source of fresh lobster, harvesting 57 million pounds (25 million kg) of these saltwater crustaceans in 2000. Maine has experienced losses in its traditional base of manufacturing jobs. Tourism is now the primary industry, driven by an increasing number of visitors to the state's coastal villages and headlands, and inland recreational areas (EWG n.d.).

Common Flora and Fauna

The fauna most likely impacted by HPAI emergency response activities are wild nonmigratory, semi-migratory, and migratory birds in the region. The Audubon Society has prioritized species of birds of conservation concern, which in Maine that live at least part of the year in the Eastern Forest Biome as defined by the Audubon Society are the black-throated blue warbler, Canada warbler, golden-winged warbler, hooded warbler, prothonotary warbler, rose-breasted grosbeak, scarlet tanager, summer tanager, and wood thrush (Michel et al. 2021). Gallinaceous birds, similar to poultry in HPAI susceptibility, include spruce grouse, ruffed grouse, wild turkeys, and ring-necked pheasant. Several species of raptors might also be impacted, especially if they were allowed to feed on HPAI infected carcasses, such as the sharp-shinned hawk, Cooper's hawk, red-shouldered hawk, broad-winged hawk, red-tailed hawk, osprey, bald eagle, northern harrier. American kestrel, merlin, peregrine falcon, black vulture, turkey vulture, barn owl, eastern screech-owl, great horned owl, northern hawk owl, great gray owl, snowy owl, and long-eared owl; many of these species rarely scavenge. Due to possible predation or scavenging of HPAI-infected wildlife, opportunistic mammalian predators such as Virginia opossum, coyotes, red and gray foxes, bobcats, Canada lynx, raccoons, black bears, striped skunks, and feral and domestic dogs and cats could eat HPAI infected birds but impacts, if any, would depend on the susceptibility of the mammalian predator to the virus and the virus strain; however, limited data is available on mammals infected with HPAI (Maine Department of Inland Fisheries Wildlife 2022).

Prior HPAI Emergency Response Actions in Maine

None by USDA APHIS VS.

Recent HPAI Detections in Maine

See Table 1 in section 1.2.

Demographics, Agricultural Land Use

See Table C-1.

Michigan

Natural Features and Industry

The total area of Michigan is 96,716 square mi (250,493 square km). Michigan is divided into two peninsulas joined by the Mackinac Bridge in 1957: the Upper Peninsula is bordered on the north by Lake Superior, on the south by Lake Michigan and Lake Huron, and on the west by Wisconsin and Minnesota; the Lower Peninsula is bordered on the west by Lake Michigan, on the east by Lake Huron and Lake Erie, and on the south by Indiana and Ohio. The terrain varies from flatland to low rolling hills to mountains. There are many state and national parks; forestry is a major activity in the Upper Peninsula. High bare dunes and beaches are a feature in the Lower Peninsula, which also contains the most industrialized section of the state (EWG n.d.).

Elevations range from 1,979 feet (603 m) above sea level to 572 feet (174 m) at the Lake Erie shoreline. The Upper Peninsula contains 34 rapids and waterfalls. Major rivers found in Michigan include the Detroit, the Grand, the St. Clair, and the St. Mary's. Rivers dammed to generate

hydroelectricity include Manistee, Pere Marquette, Muskegon, Grand, Kalamazoo, Saint Joseph, and Au Sable (EWG n.d.).

The humid continental climate of Michigan is tempered by the Great Lakes, which absorb heat in the summer months and cool off slowly during the winter months. The state experiences well defined seasons, with temperatures averaging from 83°F to 14°F (EWG n.d.).

Michigan's major crops include corn, wheat, soybeans, dry beans, hay, potatoes, apples, cherries, sugar beets, blueberries, and cucumber. Maple, oak, and aspen form the basis of Michigan's commercial timber/lumber industry. Minerals found in Michigan include iron, copper, iodine, peat, natural gas, shale, gypsum, bromine, salt, lime, and sand and gravel. Michigan's industries are chiefly concerned with manufacturing, service industries, tourism, agriculture, forestry and lumber. Automobiles and automobile products are the state's most lucrative industry (EWG n.d.).

Common Flora and Fauna

The fauna most likely impacted by HPAI emergency response activities are wild nonmigratory, semi-migratory, and migratory birds in the region. The Audubon Society has prioritized species of birds of conservation concern, which in Michigan that live at least part of the year in the Eastern Forest and Western Water Biomes as defined by the Audubon Society are the ruddy duck, king rail, sandhill crane, upland sandpiper, American woodcock, Wilson’s phalarope, least bittern, yellow-breasted chat, Louisiana waterthrush, black-throated blue warbler, Canada warbler, cerulean warbler, golden-winged warbler, hooded warbler, prairie warbler, prothonotary warbler, yellow warbler, rose-breasted grosbeak, western meadowlark, bobolink, and wood thrush (Michel et al. 2021). Gallinaceous birds, similar to poultry in HPAI susceptibility, include northern bobwhite, ruffed grouse, wild turkeys, and ring-necked pheasants. Several species of raptors might also be impacted, especially if they were allowed to feed on HPAI infected carcasses, such as the sharp-shinned hawk, Cooper’s hawk, Mississippi kite, red-shouldered hawk, broad-winged hawk, Swainson’s hawk, rough-legged hawk, red-tailed hawk, osprey, bald eagle, northern harrier, golden eagle, American kestrel, merlin, peregrine falcon, black vulture, turkey vulture, barn owl, great gray owl, northern hawk-owl, eastern screech-owl, great horned owl, snowy owl, barred owl, short-eared owl, and long-eared owl; many of these species rarely scavenge. Due to possible predation or scavenging of HPAI-infected wildlife, opportunistic mammalian predators such as Virginia opossum, coyotes, red and gray foxes, bobcats, cougar, raccoons, black bears, badger, striped skunks, and feral and domestic dogs and cats could be exposed to HPAI Impacts, if any, would depend on the susceptibility of the mammalian predator to the virus, the virus strain, and their potential to spread it; limited data is available on mammals infected with HPAI (Michigan Department of Natural Resources 2022).

Prior HPAI Emergency Response Actions in Michigan

None by USDA APHIS VS.

Recent HPAI Detections in Michigan

See Table 1 in section 1.2.

Demographics, Agricultural Land Use

See Table C-1.

New York

Natural Features and Industry

The total area of New York State is 54,556 square mi (141,299 square km). It borders Vermont, Massachusetts, and Connecticut to the east; Pennsylvania and New Jersey to the south; and the Canadian provinces of Ontario and Quebec to the north. Lakes Erie and Ontario form the greater part of the boundary between New York and Ontario. Lake Champlain forms more than half of the boundary between New York and Vermont. The state includes four islands (Fishers, Long, Manhattan, and Staten) just offshore from the mainland. Almost two thirds of the state's population live downstate, in the New York City metropolitan area (EWG n.d.).

Elevations range from sea level at Long Island to 5,344 ft (1,629 m). The two major mountain ranges in upstate New York are the Adirondacks and the Catskills. Major rivers and tributaries include the Hudson, Mohawk, and Niagara. The central region of the state contains the Finger Lakes. New York is the only state to possess shoreline on both the Atlantic Ocean and the Great Lakes. The Hudson River channel is a tidal stream more than 150 mi from the river's mouth in New York City Harbor. Lake Erie empties into Lake Ontario via the Niagara River; their difference in elevation, together with the large volume of water carried by the river, is most evident at Niagara Falls where the vertical drop totals 182 feet (55 m) (EWG n.d.).

New York has a humid continental climate with warm, humid summers and cold, wet winters. Western New York tends to be more overcast compared to south and east due to its proximity to the Great Lakes; the Great Lakes region also sees the highest occurrence of rainfall and snowfall (Lake-effect snow may total 150 to 200 inches in some areas). Thunderstorms usually come from the direction of Canada, while tropical cyclones in the southwest may impact the state during summer and autumn (Weather-atlas.com 2017).

Agriculture is important to the upstate New York economy, particularly milk production, the growing of fruits and vegetables, and the production of wine. New York State, and in particular New York City, is a leader in the financial, publishing, and fashion sectors. Tourism is of great importance to the economy across the state (EWG n.d.).

Common Flora and Fauna

The fauna most likely impacted by HPAI emergency response activities are wild nonmigratory, semi-migratory, and migratory birds in the region. The Audubon Society has prioritized species of birds of conservation concern, which in New York that live at least part of the year in the Eastern Forest Biome as defined by the Audubon Society are the brown-headed nuthatch, black-throated blue warbler, Canada warbler, cerulean warbler, golden-winged warbler, hooded warbler, prairie warbler, prothonotary warbler, rose-breasted grosbeak, scarlet tanager, summer tanager, and wood thrush (Michel et al. 2021). Gallinaceous birds, similar to poultry in HPAI susceptibility, include ruffed grouse, spruce grouse, wild turkeys, and ring-necked pheasants. Several species of raptors

might also be impacted, especially if they were allowed to feed on HPAI infected carcasses, such as the sharp-shinned hawk, Cooper's hawk, red-shouldered hawk, broad-winged hawk, red-tailed hawk, osprey, bald eagle, northern harrier, golden eagle, American kestrel, merlin, peregrine falcon, black vulture, turkey vulture, barn owl, eastern screech-owl, great horned owl, barred owl, short-eared owl, and long-eared owl; many of these species rarely scavenge. Due to possible predation or scavenging of HPAI-infected wildlife, opportunistic mammalian predators such as Virginia opossum, coyotes, red and gray foxes, bobcats, raccoons, black bears, striped skunks, and feral and domestic dogs and cats could be exposed to HPAI. Impacts, if any, would depend on the susceptibility of the mammalian predator to the virus, the virus strain, and their potential to spread it; limited data is available on mammals infected with HPAI (New York Department of Environmental Conservation 2022).

Prior HPAI Emergency Response Actions in New York

None by USDA APHIS VS.

Recent HPAI Detections in New York

See Table 1 in section 1.2.

Demographics, Agricultural Land Use

See Table C-1.

Virginia

Natural Features and Industry

The total area of Virginia is 42,769 square mi (110,771 square km). The commonwealth is bounded on the north by West Virginia and Maryland, on the south by North Carolina and Tennessee, on the west by Virginia and Kentucky, and on the east by Maryland and the Atlantic Ocean (EWG n.d.).

Elevation ranges from 5,729 ft (1,746 m) to sea level. The Potomac River flows along the northeastern boundary, and the Chesapeake Bay separates the land along the eastern shore from the rest of the state. The state's major rivers are the James, the Rappahannock, the Potomac, and the Shenandoah. Virginia's major lakes are the Atlantic Intracoastal Waterway, the Gathright Dam on Lake Moomaw, the John H. Kerr Reservoir, the John W. Flannagan Reservoir, Pound Lake, and Philpott Lake (EWG n.d.).

The climate is humid subtropical through most of the state, but the northwestern section of Virginia is humid temperate. Temperatures range from 25°F in the winter to 89°F in the summer. Annual precipitation ranges from 36 to 50 inches. Hurricanes are infrequent and tornadoes are rare in Virginia (EWG n.d.).

Forests make up approximately three-fifths of Virginia's land. Commercial agriculture includes production of tomatoes, tobacco, peanuts, apples, summer potatoes, sweet potatoes, snap beans, and turkeys and broilers. The dairy industry is also essential to Virginia's economy. Minerals produced include coal and various kinds of building stone, limestone, sand and gravel, natural gas, lime, clay,

zinc, kyanite, feldspar, gypsum, talc, uranium, and vermiculite. A third of Virginia's jobs are in the service industries, including a large number of jobs in computer and data processing centers. Manufacturing industries include transportation equipment, electronic equipment, textiles, apparel, lumber, wood products, furniture, chemicals, and food processing (EWG n.d.).

Common Flora and Fauna

The fauna most likely impacted by HPAI emergency response activities are wild nonmigratory, semi-migratory, and migratory birds in the region. The Audubon Society has prioritized species of birds of conservation concern, which in Virginia that live at least part of the year in the Eastern Forest Biome as defined by the Audubon Society are the brown-headed nuthatch, black-throated blue warbler, Canada warbler, golden-winged warbler, hooded warbler, prairie warbler, prothonotary warbler, rose-breasted grosbeak, scarlet tanager, summer tanager, and wood thrush (Michel et al. 2021). Gallinaceous birds, similar to poultry in HPAI susceptibility, include ruffed grouse, wild turkeys, and northern bobwhites. Several species of raptors might also be impacted, especially if they were allowed to feed on HPAI infected carcasses, such as the sharp-shinned hawk, Cooper's hawk, red-shouldered hawk, broad-winged hawk, red-tailed hawk, osprey, bald eagle, northern harrier, golden eagle, American kestrel, merlin, peregrine falcon, black vulture, turkey vulture, barn owl, eastern screech-owl, great horned owl, and long-eared owl; many of these species rarely scavenge. (Virginia Department of Wildlife Resources 2020). Due to possible predation or scavenging of HPAI-infected wildlife, opportunistic mammalian predators such as Virginia opossum, coyotes, red and gray foxes, bobcats, raccoons, black bears, striped skunks, and feral and domestic dogs and cats could eat HPAI infected birds but impacts, if any, would depend on the susceptibility of the mammalian predator to the virus and the virus strain; however, limited data is available on mammals infected with HPAI.

Prior HPAI Emergency Response Actions in Virginia

None by USDA APHIS VS.

Recent HPAI Detections in Virginia

See Table 1 in section 1.2.

Demographics, Agricultural Land Use

See Table C-1

Table C-1. Additional information for counties in the program area as of February 24, 2022.

County/State	% Change in Land Used for Farming, 2012 to 2017	% Share of Livestock, Poultry, and Product Sales (Not Crops) in 2017	Land Area in 2010 (miles^2)	2020 Census Population	Population at Poverty Level (percent)	% Speak Language Other Than English at Home, 2015-2019	Number of Tribes with Land Interests
New Castle/DE	+5	45	426.29	570,719	10.1	15.1	2

County/State	% Change in Land Used for Farming, 2012 to 2017	% Share of Livestock, Poultry, and Product Sales (Not Crops) in 2017	Land Area in 2010 (miles^2)	2020 Census Population	Population at Poverty Level (percent)	% Speak Language Other Than English at Home, 2015-2019	Number of Tribes with Land Interests
Dubois/IN	< 0.5 acre	72	427.27	43,637	6.7	6.0	3
Greene/IN	-7	43	542.5	30,803	11.2	1.7	2
Perry/IN	+16	61	381.73	19,170	12.3	0.7	3
Spencer/IN	-1	25	396.74	19,810	7.9	3.0	4
Fulton/KY	+17	29	205.50	6,515	25.2	2.1	5
Hickman/KY	-16	64	242.27	4,521	20.9	2.1	5
Hopkins/KY	-10	67	542.00	45,423	18.1	1.6	3
McLean/KY	+4	70	252.47	9,152	13.6	0.7	3
Webster/KY	+7	63	331.94	13,017	15.6	5.7	4
Cecil/MD	-4	43	346.27	103,725	8.8	5.5	3
Kent/MD	+1	38	277.03	19,198	12.0	6.2	2
Knox/ME	-13	30	365.13	40,607	10.2	3.2	2
Lincoln/ME	-19	65	455.82	35,237	8.8	2.7	2
Kalamazoo/MI	-3	26	561.66	261,670	12.0	7.3	12
Suffolk/NY	-17	10	912.05	1,525,920	6.1	22.7	11
Obion/TN	-11	28	544.73	30,787	15.1	4.1	3
Fauquier/VA	-5	60	647.45	72,972	6.0	9.1	1

Source: (USDA NASS 2017; TDAT 2022; USCB 2022).
Additional counties affected by HPAI outbreaks since February 24th will be covered in a supplemental NEPA document currently being prepared by USDA APHIS VS.

Certain Maryland and Tennessee counties are listed in Table because, as of February 24, 2022, they fell within 10-km surveillance zones around the HPAI outbreak locations in Delaware and Kentucky, respectively. Since February 24th and the preparation of the draft EA, HPAI outbreaks were confirmed in Cecil and Queen Anne's Counties, Maryland, but no HPAI outbreaks have occurred in Tennessee.

Table C-2. The common and scientific names of bird and mammal species listed in Appendix C in taxonomic order.

Birds

Common Name	Scientific Name
Ruddy Duck	*Oxyura jamaicensis*
Northern Bobwhite	*Colinus virginianus*
Wild Turkey	*Meleagris gallopavo*
Ruffed Grouse	*Bonasa umbellus*
Spruce Grouse	*Canachites canadensis*
Ring-necked Pheasant	*Phasianus colchicus*
King Rail	*Rallus elegans*
Sandhill Crane	*Antigone canadensis*
Whooping Crane	*Grus americana*
Black-necked Stilt	*Himantopus mexicanus*
Upland Sandpiper	*Bartramia longicauda*
Red Knot	*Calidris canutus*
Western Sandpiper	*Calidris mauri*
American Woodcock	*Scolopax minor*
Wilson's Phalarope	*Phalaropus tricolor*
Least Tern	*Sternula antillarum*
Great Cormorant	*Phalacrocorax carbo*
Least Bittern	*Ixobrychus exilis*
Reddish Egret	*Egretta rufescens*
Black Vulture	*Coragyps atratus*
Turkey Vulture	*Cathartes aura*
Osprey	*Pandion haliaetus*
Golden Eagle	*Aquila chrysaetos*
Northern Harrier	*Circus hudsonius*
Sharp-shinned Hawk	*Accipiter striatus*
Cooper's Hawk	*Accipiter cooperii*
Northern Goshawk	*Accipiter gentilis*
Bald Eagle	*Haliaeetus leucocephalus*
Mississippi Kite	*Ictinia mississippiensis*
Red-shouldered Hawk	*Buteo lineatus*
Broad-winged Hawk	*Buteo platypterus*
Swainson's Hawk	*Buteo swainsoni*
Red-tailed Hawk	*Buteo jamaicensis*
Rough-legged Hawk	*Buteo lagopus*
Barn Owl	*Tyto alba*
Eastern Screech-Owl	*Megascops asio*
Great Horned Owl	*Bubo virginianus*
Snowy Owl	*Bubo scandiacus*
Northern Hawk Owl	*Surnia ulula*
Barred Owl	*Strix varia*
Great Gray Owl	*Strix nebulosa*
Long-eared Owl	*Asio otus*
Short-eared Owl	*Asio flammeus*
Northern Saw-whet Owl	*Aegolius acadicus*
Belted Kingfisher	*Megaceryle alcyon*
American Kestrel	*Falco sparverius*
Merlin	*Falco columbarius*
Peregrine Falcon	*Falco peregrinus*
Bell's Vireo	*Vireo bellii*
Brown-headed Nuthatch	*Sitta pusilla*
Wood Thrush	*Hylocichla mustelina*
Yellow-breasted Chat	*Icteria virens*
Bobolink	*Dolichonyx oryzivorus*
Western Meadowlark	*Sturnella neglecta*
Louisiana Waterthrush	*Parkesia motacilla*
Golden-winged Warbler	*Vermivora chrysoptera*
Prothonotary Warbler	*Protonotaria citrea*
Swainson's Warbler	*Limnothlypis swainsonii*
Hooded Warbler	*Setophaga citrina*
Cerulean Warbler	*Setophaga cerulea*
Yellow Warbler	*Setophaga petechia*
Black-throated Blue	*Setophaga caerulescens*
Prairie Warbler	*Setophaga discolor*
Canada Warbler	*Cardellina canadensis*
Summer Tanager	*Piranga rubra*
Scarlet Tanager	*Piranga olivacea*
Rose-breasted Grosbeak	*Pheucticus ludovicianus*

Mammals

Common Name	Scientific Name
Virginia opossum	*Didelphis virginianus*
Bobcat	*Lynx rufus*
Canada Lynx	*Lynx canadensis*
House Cat	*Felis catus*
Coyote	*Canis latrans*
Domestic Dog	*Canis familiaris*
Red Fox	*Vulpes vulpes*
Gray Fox	*Urocyon cinereoargenteus*
Black Bear	*Ursus americanus*
Fisher	*Martes pennanti*
American Badger	*Taxidea taxus*
Striped Skunk	*Mephitis mephitis*
Eastern Spotted Skunk	*Spilogale putorius*
Feral Domestic Swine	*Sus scrofa*