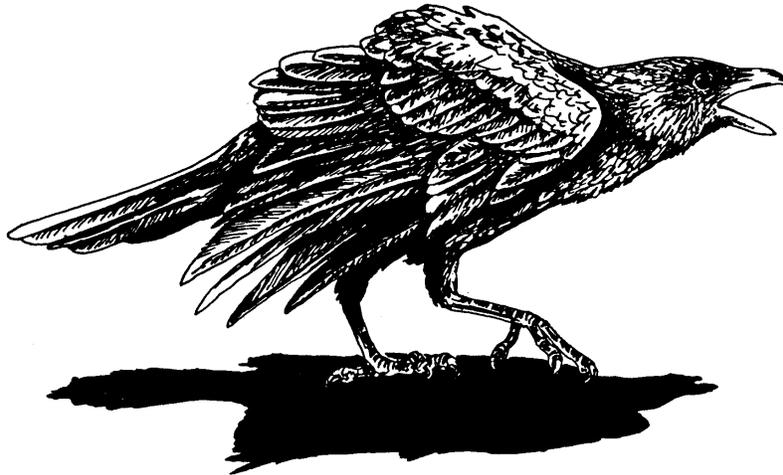


ENVIRONMENTAL ASSESSMENT

of

**BIRD DAMAGE MANAGEMENT
IN KANSAS**



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Animal and Plant Health Inspection Service
Kansas Wildlife Services Program**

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ACRONYMS USED

AI	Avian Influenza
APHIS	Animal and Plant Health Inspection Service
BBS	Breeding Bird Survey
BDM	Bird Damage Management
BO	Biological Opinion
CAFO	Confined Animal Feeding Operation
CBC	Christmas Bird Count
CFR	Codes of Federal Regulations
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FDA	Food and Drug Administration
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FY	Fiscal Year
HP	Highly Pathogenic
IWDM	Integrated Wildlife Damage Management
KASS	Kansas Agricultural Statistics Service
KDA	Kansas Department of Agriculture
KDWP	Kansas Department of Wildlife and Parks
KSA	Kansas Statutes Annotated
WS-Kansas	Kansas Wildlife Services Program
LC50	Lethal Concentration in Water that Kills 50%
LD50	Lethal Dose that Orally Kills 50%
MA	Methyl-anthranilate
MIS	Management Information System
MOU	Memorandum of Understanding
NAS	National Audubon Society
NEPA	National Environmental Policy Act
NHPA	National Historical Preservation Act
NWRC	WS-National Wildlife Research Center
<i>P</i>	Probability
SMC	Species of Management Concern
SNC	Species in Need of Conservation
T&E	Threatened and Endangered
USC	U.S. Code
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
WDM	Wildlife Damage Management
WS	Wildlife Services

CHAPTER 1: PURPOSE OF AND NEED FOR ACTION

1.1 INTRODUCTION

While wildlife is a valuable natural resource, some species of wildlife can cause problems with human interests. Many bird species, those that reside in or migrate into or through Kansas, can come into conflict with human interests at sometime or another, and may need to be managed to control their damage. The U.S. Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), Wildlife Services (WS) program has personnel with expertise to respond to damage caused by wildlife, including birds.

USDA-APHIS-WS is authorized by Congress to manage a program to reduce human/wildlife conflicts. WS' mission, developed through a strategic planning process (APHIS 2007), is to "... *provide Federal leadership in managing problems caused by wildlife. WS recognizes that wildlife is an important public resource greatly valued by the American people. By its very nature, however, wildlife is a highly dynamic and mobile resource that can damage agricultural and industrial resources, pose risks to human health and safety, and affect other natural resources. The WS program carries out the Federal responsibility for helping to solve problems that occur when human activity and wildlife are in conflict with one another.*" This is accomplished through:

- < training of wildlife damage management (WDM) professionals;
- < development and improvement of strategies to reduce economic losses and threats to humans from wildlife;
- < the collection, evaluation, and dissemination of management information;
- < cooperative WDM programs;
- < informing and educating the public on how to reduce wildlife damage; and
- < providing technical advice and a source for limited use of management materials and equipment such as cage traps.

This Environmental Assessment (EA) evaluates ways that this responsibility could be carried out to resolve conflicts with bird species in Kansas. Bird damage management (BDM) is an important function of the Kansas WS Program (WS-Kansas). Appendix B lists all bird species that have been found in Kansas with Table B1 listing those species that have the highest probability of coming into conflict with people in Kansas or being part of disease surveillance projects.

WS-Kansas is a cooperatively funded and service oriented program. Before operational BDM is conducted, *Work Initiation Documents* (WID) must be signed by WS-Kansas and the land owner/administrator. WS-Kansas cooperates with private property owners, managers, and land and wildlife management agencies, as requested, with the goal of effectively and efficiently resolving wildlife damage problems in compliance with all applicable federal, state, and local laws.

APHIS-WS has the Federal statutory authority under the Act of March 2, 1931, as amended, and the Act of December 22, 1987, to cooperate with other Federal agencies and programs, States, local jurisdictions, individuals, public and private agencies, organizations, and institutions while conducting a program of wildlife services involving animal species that are injurious or a nuisance to, among other things, agriculture, horticulture, forestry, animal husbandry, natural resources such as wildlife, and human health and safety as well as conducting a program of wildlife services involving mammalian and avian (*bird*) species that are reservoirs for zoonotic diseases.

1.2 PURPOSE

The purpose of this EA is to analyze the effects of WS-Kansas activities in Kansas to manage damage caused by bird species or species groups. WS-Kansas BDM activities are conducted to protect human health and safety at airports and threats of human disease, agricultural resources including livestock and their feed and health, crops, aquaculture, property such as homes, aircraft, turf, machinery, electrical equipment, and ornamental trees, and natural resources such as threatened and endangered (T&E) species, other wildlife, fisheries, and public recreation areas. Kansas has 320 species of birds that can be found regularly in all or a portion of the State at some time during the year. An additional 119 species have been documented to occur in Kansas, but are outside of the species' normal rangesome of these species are seen annually and a few may even nest, but not in any abundance or regularity. Of the regular residents, 113 (not including T&E species) will be the focuse of WS-Kansas BDM. Of these, 86 species could be targeted to protect resources other than aircraft and human health and safety at airports. The species that this EA will address are those that are normally found in Kansas and cause problems and are listed in Appendix B: Table B1. The primary species that WS-Kansas receives requests for assistance, mostly in order of BDM assistance given by WS-Kansas, include European Starlings (*Sturnus vulgaris*)¹, feral domestic pigeons (*Columbia livia domestica*), blackbird spp. (*Icteridae spp.*) (blackbirds, grackles, and cowbirds), House Sparrows (*Passer domesticus*), Canada Geese (*Branta canadensis*), Snow Geese (*Anser caerulescens*), Mallards (*Anas platyrhynchos*), Cattle Egrets (*Bubulcus ibis*), American Crows (*Corvus brachyrhynchos*), Turkey Vultures (*Cathartes aura*), and woodpeckers (*Picidae* family). Several other species cause minor, but potentially locally serious, problems mostly at airports. All of these species or their groups will be discussed in Section 2.2.1. However, WS-Kansas does have the potential of being involved with any bird species in Kansas.

The analyses contained in this EA is based on information derived from WS' Management Information System (MIS), data from the United States Fish and Wildlife Service (USFWS), available documents (see Appendix A), interagency consultations, public involvement, and other environmental documents.

This EA evaluates the need for action to manage damage associated with birds in the state, the potential issues associated with BDM, and the environmental consequences of conducting alternative approaches to meeting the need for action while addressing the identified issues. WS-Kansas initially developed the issues and alternatives associated with BDM in consultation with the USFWS and the Kansas Department of Wildlife Parks and Tourism (KDWPT). The USFWS has the overall regulatory authority to manage populations of migratory bird species, while KDWPT has the authority to manage wildlife populations in the State of Kansas. To assist with identifying additional issues and alternatives to BDM, WS-Kansas made this EA available to the public for review and comment prior to the issuance of a Decision².

WS has previously developed an EA that analyzed the need for action to manage damage associated with several bird species in Kansas. Changes in the need for action and the affected environment have prompted WS to initiate this new analysis to manage bird damage in the state. This new EA will address more recently identified changes and will assess the potential environmental impacts of program alternatives based on a new need for action, primarily a need to address damage and threats of damage associated with several additional species of birds. Because this EA will re-evaluate those activities conducted under the previous EA to address the new need for action and the associated affected environment, the analysis and the outcome of the Decision issued for this EA will supersede the 2008 Kansas Bird Damage EA and FONSI.

¹ Bird species found in Kansas and their scientific names are given in Appendix B.

²After the development of the EA by WS and consulting agencies and after public involvement in identifying new issues and alternatives, WS will issue a Decision. Based on the analyses in the EA and public involvement, a decision will be made to either publish a Notice of Intent to prepare an Environmental Impact Statement or publish a notice a Finding of No Significant Impact in accordance to the NEPA and the Council of Environmental Quality regulations.

This EA will assist in determining if the proposed management of damage associated with birds could have a significant impact on the environment for both people and other organisms. This EA will analyze several alternatives to address the need for action and the identified issues and document the environmental consequences of the alternatives to comply with the National Environmental Policy Act (NEPA). In addition, this new EA will inform the public and coordinate efforts between WS, the USFWS, the KDWPT, and other entities.

According to APHIS procedures implementing the National Environmental Policy Act (NEPA), individual WDM actions, and research and developmental activities may be categorically excluded (7 Code of Federal Regulation (CFR) 372.5(c), 60 Fed. Reg. 6000-6003, 1995). However, we prepared this EA on BDM in Kansas to facilitate planning and interagency coordination, to streamline program management, and to involve the public and obtain their input through comments and feedback. WS-Kansas made the EA available to the public for review and comment by a legal notice published in the *Topeka Capital Journal*. WS also made the EA available to the public for review and comment on the APHIS website on August 28, 2019 and on the federal e-rulemaking portal at the regulations.gov website beginning on August 27, 2019. WS sent a notice of availability directly to agencies, stakeholders, organizations, and individuals with probable interest in managing bird damage in the state through the gov. delivery portal on August 28, 2019. The opportunity for public comment closed on October 4, 2019. During the public comment period, WS-Kansas only received four comment submissions on regulations.gov, none of which contained any substantive information. Comments that oppose or support an agencies actions without any substantive information included in the comment do not warrant an agency response.

1.3 NEED FOR ACTION

Birds are responsible for damaging of a wide variety of agricultural resources, property, and natural resources. In addition, birds can be a threat to human health and safety. From federal fiscal year 2015 (FY15) to federal fiscal year 2018 (FY18) birds were responsible for 388 requests for assistance, 38 for agriculture (including aquaculture), and 299 for human health and safety, 45 for property, and 6 for utilities (388 total requests). This information is kept in the MIS¹. Requests for assistance are an indication of need, but the requests that WS-Kansas receives likely represent only a portion of the need in actuality. Therefore, WS-Kansas loss reports do not actually reflect the total value of bird damage in Kansas, but provides an indicator of the annual losses. Also, some people are unaware of the WS-Kansas and may try to resolve problems themselves without requesting WS-Kansas assistance.

¹ **MIS** - Computer-based Management Information System used by WS for tracking Program activities. WS in Kansas has had the SQL-based MIS system operational since 1993, but was replaced with MIS 2000 10/01/04. Differences in the systems and current reports have reduced some output such as damage losses. MIS reports will not be referenced in the Literature Cited Section since most reports from the MIS are not kept on file. A database is kept that allows queries to be made to retrieve the information needed.

1.3.1 Summary of Proposed Action

The proposed action is to continue the current portion of the WS program in Kansas that responds to requests for BDM to protect human health and safety, agricultural resources such as livestock feed, livestock, livestock health, aquaculture, and crops, property such as turf, landscaping, and structures, and natural resources such as T&E species, other wildlife, and forestry in Kansas. A major component of WS-Kansas BDM activities has been the goal of reducing threats or hazards to human health and safety from birds such as gulls, raptors, shorebirds, and pigeons at airports, damage or the threat of loss to agricultural crops from crows and geese, and loss of livestock feed and the risk of bird-related livestock health problems presented by starlings and blackbirds at dairies and feedlots. Program goals are also to minimize damage or the risk of damage to other agricultural resources, natural resources such as wildlife species, property, or other public or private resources from birds. To meet these goals WS-Kansas has the objective of responding to all requests for assistance with, at a minimum, technical assistance or self-help advice, or, where appropriate and when cooperative or congressional funding is available, direct control assistance where professional WS-Kansas personnel conduct BDM. An Integrated Wildlife Damage Management (IWDM) approach is implemented which allows the use of any legal technique or method (discussed in Section 3.3.1.3), used singly or in combination, to meet the needs of requestors for resolving conflicts with birds. Agricultural producers and others requesting assistance are provided with information regarding the use of effective nonlethal and lethal techniques. Lethal methods used by WS-Kansas would include shooting, trapping, egg addling/destruction, DRC-1339, Avitrol®, and live capture by trapping. Nonlethal methods used by WS-Kansas may include wire barriers and deterrents such as porcupine wire, netting, and fencing, chemical repellents (e.g., methyl anthranilate, polybutene products), and harassment with auditory devices (e.g., propane cannons, pyrotechnics, distress calls) and visual repellents (e.g., reflective tape, human effigies, balloons). In many situations, the implementation of nonlethal methods such as exclusion-type barriers would be the responsibility of the requestor to implement. BDM by WS-Kansas would be allowed in the State, when requested, on private property sites or public facilities where a need has been documented, upon completion of a WID. All management actions would comply with appropriate federal, state, and local laws.

1.3.2 Need for BDM to Protect Human Health and Safety

1.3.2.1 Disease. Feral pigeons and starlings have been suspected in the transmission of 29 different diseases to humans, (Weber 1979 and Davis et al. 1971). These include viral diseases such as meningitis and seven different forms of encephalitis; bacterial diseases such as erysipeloid, salmonellosis, paratyphoid, Pasteurellosis, and Listeriosis; mycotic (fungal) diseases such as aspergillosis, blastomycosis, candidiasis, cryptococcosis, histoplasmosis, and sarcosporidiosis; protozoal diseases such as American trypanosomiasis and toxoplasmosis; and rickettsial/chlamydial diseases such as chlamydiosis and Q fever (Figure 1). As many as 65 different diseases transmittable to humans or domestic animals have been associated with feral pigeons, starlings, and House Sparrows (Weber 1979). In most cases in which human health concerns are a major reason for requesting BDM, no actual cases of bird transmission of disease to humans have been proven to occur. The risk of disease transmission from birds is often the underlying reason people request assistance from WS-Kansas.

Many times, individuals or property owners that request assistance with feral domestic pigeon or nuisance blackbird or starling roost problems are concerned about potential disease risks but are unaware of the types of diseases that can be associated with these birds. In most situations, BDM is requested because the droppings left by concentrations of birds is aesthetically displeasing and can result in continual clean-up costs.

Further problems arise as resident Canada Geese and other waterfowl have become accustomed to and are successful in suitable urban habitats. These resident geese are becoming more and more of a nuisance around public parks, lakes, housing developments, and golf courses as they sometimes attack humans. The threat to human health from high fecal coliform (e.g., *Escherichia coli*) levels and other pathogens including *Cryptosporidium parvum*, *Giardia lamblia*, and *Salmonella spp.* is also associated with large amounts of droppings (Clark 2003).

Disease	Human Symptoms	Potential for Human Fatality	Effects on Domestic Animals
BACTERIAL			
crisipeloid	skin eruption with pain, itching; headaches, chills, joint pain, prostration, fever, vomiting	sometimes - particularly in young children, old or infirm people	serious hazard for the swine industry
salmonellosis	gastroenteritis, septicemia, persistent infection	possible, especially in individuals weakened by other disease or old age	causes abortions in mature cattle, possible mortality in calves, decrease in milk production in dairy cattle
Pasteurellosis	respiratory infection, nasal discharge, conjunctivitis, bronchitis, pneumonia, appendicitis, urinary bladder inflammation, abscessed wound infections	rarely	may fatally affect chickens, turkeys and other fowl
Listeriosis	conjunctivitis, skin infections, meningitis in newborns, abortions, premature delivery, stillbirth	sometimes - particularly with newborns	In cattle, sheep, and goats, difficulty swallowing, nasal discharge, paralysis of throat and facial muscles
VIRAL			
meningitis	inflammation of membranes covering the brain, dizziness, and nervous movements	possible — can also result as a secondary infection with Listeriosis, salmonellosis, cryptococcosis	causes middle ear infection in swine, dogs, and cats
encephalitis (8 forms)	headache, fever, stiff neck, vomiting, nausea, drowsiness, disorientation	mortality rate for eastern equine encephalomyelitis may be around 60%	may cause mental retardation, convulsions and paralysis
MYCOTIC (FUNGAL)			
aspergillosis	affects lungs and broken skin, toxins poison blood, nerves, and body cells	not usually	causes abortions in cattle
blastomycosis	weight loss, fever, cough, bloody sputum and chest pains.	rarely	affects horses, dogs and cats
candidiasis	infection of skin, fingernails, mouth, respiratory system, intestines, and urogenital tract	rarely	causes mastitis, diarrhea, vaginal discharge and aborted fetuses in cattle
cryptococcosis	lung infection, cough, chest pain, weight loss, fever or dizziness, also causes meningitis	possible especially with meningitis	chronic mastitis in cattle, decreased milk flow and appetite loss
histoplasmosis	pulmonary or respiratory disease. May affect vision	possible, especially in infants and young children or if disease disseminates to the blood and bone marrow	actively grows and multiplies in soil and remains active long after birds have departed
PROTOZOAL			
American trypanosomiasis	infection of mucous membranes of eyes or nose, swelling	possible death in 2-4 weeks	caused by the conenose bug found on pigeons
toxoplasmosis	inflammation of the retina, headaches, fever, drowsiness, pneumonia, strabismus, blindness, hydrocephalus, epilepsy, and deafness	possible	may cause abortion or still birth in humans, mental retardation
RICKETTSIAL/CHLAMYDIAL			
chlamydiosis	pneumonia, flu-like respiratory infection, high fever, chills, loss of appetite, cough, severe headaches, generalized aches and pains, vomiting, diarrhea, hepatitis, insomnia, restlessness, low pulse rate	occasionally, restricted to old, weak or those with concurrent diseases	in cattle, may result in abortion, arthritis, conjunctivitis, and enteritis
Q fever	sudden pneumonitis, chills, fever, weakness, severe sweating, chest pain, severe headaches and sore eyes	possible	may cause abortions in sheep and goats

Figure 1. Diseases transmittable to humans and livestock associated with feral pigeons, starlings and House Sparrows (copied from Weber 1979).

Avian Influenza (AI). Wild and domestic waterfowl are the acknowledged natural reservoirs for a variety of AI viruses (Davidson and Nettles 1997, Pedersen et al. 2010). However, AI viruses can be

found amongst a variety of other bird species (Alexander 2000, Stallknecht 2003). AI can circulate among those birds without clinical signs and is not an important mortality factor in wild waterfowl (Davidson and Nettles 1997, Clark and Hall 2006). However, the potential for avian influenza to produce devastating disease in domestic poultry makes its occurrence in waterfowl an important issue (Davidson and Nettles 1997, Clark and Hall 2006, Gauthier-Clerc et al. 2007). The most common strains of avian influenza found in wild birds are low pathogenic strains (Stallknecht 2003, Pedersen et al. 2010), but high pathogenic strains have also been found to exist in wild waterfowl species (Brown et al. 2006, Keawcharoen et al. 2008). Although AI is primarily a disease of birds, there can be concerns over the spread of the H5N1 highly pathogenic strain that has shown transmission potential to humans with potential for mortalities (Gauthier-Clerc et al. 2007, Peiris et al. 2007, Majumdar et al. 2011). Outbreaks of other avian influenza strains have also shown the potential to be transmissible to people during severe outbreaks when people handle infected poultry (Koopmans et al. 2004, Tweed et al. 2004). A pandemic outbreak of avian influenza could have impacts on human health and economies (World Health Organization 2005, Peiris et al. 2007).

While transmission of diseases or parasites from birds to people has not been well documented, the potential exists (Luechtefeld et al. 1980, Wobeser and Brand 1982, Hill and Grimes 1984, Pacha et al. 1988, Hatch 1996, Graczyk et al. 1997, Saltoun et al. 2000, Kassa et al. 2001). In some cases, infections may even be life threatening for people with suppressed or compromised immune systems (Roffe 1987, Graczyk et al. 1998). Even though many people are concerned about disease transmission from feces, the probability of contracting a disease from feces is believed to be small. However, human exposure to fecal droppings through direct contact or through the disturbance of accumulations of fecal droppings where disease organisms are known to occur increases the likelihood of disease transmission. Several of the bird species addressed in this EA are closely associated with the activities of people and they often exhibit gregarious roosting and nesting behavior. This gregarious behavior can lead to accumulations of fecal droppings that could be considered a threat to human health and safety due to the close association of those species of birds with people. Accumulations of bird droppings in public areas are aesthetically displeasing and are often in areas where people may come in direct contact with fecal droppings. In most cases in which human health concerns are a major reason for requesting assistance, no actual cases of bird transmission of disease to humans have been proven to occur. Thus, the risk of disease transmission would be the primary reason people request assistance. WS recognizes and defers to the authority and expertise of local and state health officials in determining what does or does not constitute a threat to public health.

1.3.2.2 Need for BDM at Airports. An increase in air traffic (Federal Aviation Administration (FAA) 2007) along with increases in certain wildlife species that are commonly involved in bird strikes (waterfowl, gulls, raptors, blackbirds/starlings, and other species) have contributed greatly to the increase in the number of reported strikes. From FY15 through FY18, Kansas aviation officials reported 194 bird strikes (FAA National Wildlife Strike Database).

Bird strikes can cause catastrophic failure of aircraft systems (*e.g.*, ingesting birds into engines), which can cause the plane to become uncontrollable leading to crashes. The civil and military aviation communities have acknowledged that the threat to human health and safety from aircraft collisions with wildlife is increasing (Dolbeer 2000, MacKinnon et al. 2004). However, it is more common for wildlife-aircraft strikes to result in expensive repairs, flight delays, or aborted aircraft movements than in injury or loss of human life.

While bird strikes that result in human fatalities are rare, the consequences can be catastrophic. The worst strike on record for loss of human lives in the United States occurred in Boston during 1960 when 62 people were killed in the crash of an airliner that collided with a flock of European starlings (Terres 1980, Dolbeer and Wright 2008). In 1995, 24 lives were lost when a military aircraft struck a flock of Canada

geese at Elmendorf, Alaska. In addition, a \$190 million plane was lost (Dolbeer 1997). A recent example occurred in Oklahoma where an aircraft struck American White Pelicans (*Pelecanus erythrorhynchos*) causing the plane to crash killing all five people aboard (Dove et al. 2009). Between 1990 and 2015, 25 human fatalities have occurred after aircraft struck birds in the United States (Dolbeer et al. 2016). Of those 25 fatalities involving bird strikes, 8 fatalities occurred after striking birds that were not identified, 8 fatalities occurred after strikes involving Red-tailed Hawks, 5 fatalities occurred after striking American White Pelican, 2 fatalities occurred from Canada Goose strikes, and fatality each occurred from Turkey Vultures and Brown Pelicans (Dolbeer et al. 2016). Since 1988, wildlife strikes have killed more than 262 people and destroyed over 247 aircraft globally (Dolbeer et al. 2016).

Injuries can also occur to pilots and passengers from bird strikes. Between 1990 and 2015, 229 bird strikes involving civil aircraft have caused 400 injuries to people in the United States, including strikes with vultures, waterfowl, gulls, raptors, egrets, pigeons, robins (*Turdus migratorius*), doves, blackbirds, sparrows, and owls (Dolbeer et al. 2016). Between 1990 and 2015, 53 strikes involving waterfowl have resulted in injuries to 159 people, while 34 strikes involving vultures resulted in injuries to 42 people (Dolbeer et al. 2016).

Several significant strikes that have occurred in Kansas are:

In 1998, four geese struck an Aero Commander 500 prompting the pilot to declare an emergency and to return to Billard Airport near Lake Perry after temporarily losing control. Major damage to the aircraft was reported and the plane was out of service for two months for repairs.

During a lift off at Wichita's Mid-Continent Airport in September of 1999, an MD-83, carrying Secretary of Agriculture Dan Glickman, struck a flock of starlings causing the pilot to declare an emergency and return to land.

In March of 2000, a B747 at Forbes Field ingested an unknown bird into one of its engines causing a compressor stall and flameout. The engine and nose cowl were removed and replaced at a cost of \$445, 990.

To date, no documented wildlife strikes have resulted in loss of human life in Kansas; however, strikes continue to occur, increasing the risk for a catastrophic event.

1.3.3 Need for BDM at Confined Animal Feeding Operations (CAFOs)

Starlings and blackbirds, and, to a lesser extent, feral domestic pigeons and house sparrows often cause damage at CAFOS, specifically cattle and hog feeding facilities and dairies, by congregating in large numbers to feed on the grain component of livestock feed. These birds also cause damage by defecating on fences, shade canopies, and other structures which can accelerate corrosion of metal components. Droppings from these species, especially starlings, have clean-up costs associated with them and are considered unsightly. Additionally, these birds and their droppings are a source of several diseases that can infect feedlot operators, their personnel, and livestock. Some CAFOs suffer additional damage in the form of lost business because some customers tend to avoid facilities that have excessive numbers of birds present during a significant portion of the year.

Contribution of Livestock and Dairies to the Economy. Livestock and dairy production in Kansas contributes substantially to local economies. In 2016, the number of cattle on feed was 2.3 million which ranks third nationally and represents 18% of all cattle fed in the United States. The inventory value of all

cattle and calves in Kansas was reported at \$6.09 billion dollars. The state had 150,000 milk cows in 2016 which produced 3.3 billion lbs. of milk. Kansas dairy operators generated \$535 million in producer gross income in 2016 (Kansas Agricultural Statistics Service (KASS) 2016).

Scope of Livestock Feed Losses. The problem of starling damage to livestock feed has been documented in France and Great Britain (Feare 1984), and in the United States (Besser et. al. 1968). The concentration of larger numbers of cattle eating huge quantities of feed in confined pens results in a tremendous attraction to starlings, blackbirds, and feral domestic pigeons. Diet rations for cattle contain all of the nutrients and fiber that cattle need, and are so thoroughly mixed that cattle are unable to select any one component over others. The basic constituent of most rations is silage and the high energy portion is usually provided with corn, which may be incorporated as whole grains, crushed, or steamed and flaked. While cattle cannot select individual ingredients from that ration, starlings can and do select the corn portion, thereby altering the energetic value of the complete diet. The removal of this high energy fraction by starlings, is believed to reduce milk yields, weight gains, and is economically significant (Feare 1984). Glahn and Otis (1986) reported that starling damage was also associated with proximity to roosts, snow, and freezing temperatures and the number of livestock on feed.

The economic significance of feed losses to starlings has been demonstrated by Besser et al. (1968) who concluded that the value of losses in feedlots near Denver, Colorado was \$84 per 1,000 birds in 1967. Forbes (1995) reported starlings consume up to 50% of their body weight in feed each day. Glahn and Otis (1981) reported losses of 4.8 kg of pelletized feed consumed per 1,000 bird minutes. Glahn (1983) reported that 25.8% of farms in Tennessee experienced starling depredation problems of which 6.3% experienced significant economic loss. Williams (1983) estimated seasonal feed losses to five species of blackbirds (primarily brown-headed cowbirds) at one feedlot in south Texas at nearly 140 tons valued at \$18,000.

A cost:benefit analysis of starling depredation at CAFOs in Nevada (WS 2006) that received WS BDM services found that the cost of only livestock feed losses prevented (the analysis did not include livestock health related problems) to providing BDM services was 4.6:1. For every dollar spent providing BDM, \$4.60 was saved by CAFO operators. The CAFOs in Nevada had similar, but often less starlings than CAFOs in Kansas. Another analysis of blackbird and starling depredation at 10 cattle feeding facilities in Arizona that used WS BDM services conservatively estimated that the value of feed losses on the 10 facilities would have been about \$120,000 without WS BDM services which cost approximately \$40,000/yr (WS 1996). A similar analysis has not been performed for Kansas feedlots. However, blackbird and starling numbers that have been observed by WS-Kansas personnel at Kansas feedlots have generally been many times greater than the numbers observed at the Arizona facilities (WS 1996). Therefore, the value of feed losses at Kansas feedlots is probably much greater per facility than calculated in the Arizona analysis. Depenbusch et al. (2011) estimated that feed consumption by European Starlings increased the daily production cost by \$0.92 per animal.

Scope of Livestock Health Problems. Damage and threats to livestock operations can also occur from the risk of or actual transmission of diseases from birds to livestock. Agricultural areas provide ideal habitat for many bird species, which can be attracted in large numbers to those locations. Large concentrations of birds feeding, roosting, or loafing in these areas increases the possibility of and the concern over the transmission of diseases from birds to livestock. This concern can have far-reaching implications (Daniels et al. 2003, Fraser and Fraser 2010, Miller et al. 2012). Birds feeding alongside livestock in open livestock feeding areas or feeding on stored livestock feed can leave fecal deposits, which can be consumed by livestock. Fecal matter can also be deposited in sources of water for livestock, which increases the likelihood of disease transmission and can contaminate other surface areas where livestock can encounter fecal matter deposited by birds. Many bird species, especially those encountered

at livestock operations, are known to carry infectious diseases which can be excreted in fecal matter and pose not only a risk to individual livestock operations, but can be a source of transmission to other livestock operations as birds move from one area to another.

Most livestock health problems associated with birds in Kansas occur at CAFOs where indirect losses from the transmission of disease from birds to livestock such as coccidiosis, transmissible gastroenteritis virus, and tuberculosis can occur. Some of these diseases have been linked primarily to migratory flocks of starlings and blackbirds (Gough and Beyer 1982). Several diseases that arise in birds affect livestock and have been associated with feral domestic pigeons, starlings, blackbirds, and House Sparrows (Figure 2). Although yet to be proven scientifically, transmission of diseases such as transmissible gastroenteritis virus, tuberculosis, and coccidiosis to livestock have been suspected as being linked to migratory flocks of starlings and blackbirds. Estimates of the dollar value of this type of damage are not available. A consulting veterinarian for a large cattle feeding operation in Texas indicated problems associated with coccidiosis declined following reduction of starling and blackbird numbers using the facility (R. Gilliland, WS, TX, pers. comm. 2007). Starlings were implicated in a transmissible gastroenteritis virus outbreak that killed more than 10,000 pigs in one county in southeast Nebraska in the winter of 1978-79 (Johnson and Glahn 1994).

Although it is difficult to document, there is a strong association of wild birds and the contamination of food and water sources at livestock facilities. The potential for introduction of *E. coli* or salmonella to a livestock operation or the transmission of these pathogens between sites by wild birds is a strong possibility (Pedersen and Clark 2007).

Disease	Livestock affected	Symptoms	Comments
BACTERIAL			
erysipeloid	cattle, swine, horses, sheep, goats, chickens, turkeys, ducks	Pigs - arthritis, skin lesions, necrosis, septicemia Sheep - lameness	serious hazard for the swine industry, rejection of swine meat at slaughter due to septicemia, also affects dogs
salmonellosis	all domestic animals	abortions in mature cattle, mortality in calves, decrease in milk production in dairy cattle Colitis in pigs,	over 1700 serotypes
Pasteurellosis	cattle, swine, horses, rabbits, chickens, turkeys	Chickens and turkeys die suddenly without illness pneumonia, bovine mastitis, abortions in swine, septicemia, abscesses	also affects cats and dogs
avian tuberculosis	chickens, turkeys, swine, cattle, horses, sheep	Emaciation, decrease in egg production, and death in poultry. Mastitis in cattle	also affects dogs and cats
Streptococcosis	cattle, swine, sheep, horses, chickens, turkeys, geese, ducks, rabbits	Emaciation and death in poultry. Mastitis in cattle, abscesses and inflammation of the heart, and death in swine	feral pigeons are susceptible and aid in transmission
yersinosis	cattle, sheep, goats, horses, turkeys, chickens, ducks	abortion in sheep and cattle	also affects dogs and cats
vibriosis	cattle and sheep	In cattle, often a cause of infertility or early embryonic death. In sheep, the only known cause of infectious abortion in late pregnancy	of great economic importance
Listeriosis	Chickens, ducks, geese, cattle, horses, swine, sheep, goats	In cattle, sheep, and goats, difficulty swallowing, nasal discharge, paralysis of throat and facial muscles	also affects cats and dogs
VIRAL			
meningitis	cattle, sheep, swine, poultry	inflammation of the brain, newborn calve unable to suckle	associated with Listeriosis, salmonellosis, cryptococcosis
encephalitis (8 forms)	horses, turkeys, ducks	drowsiness, inflammation of the brain	mosquitoes serve as vectors
MYCOTIC (FUNGAL)			
aspergillosis	cattle, chickens, turkeys, and ducks	abortions in cattle	common in turkey poults
		Rarely	affects horses, dogs and cats
candidiasis	cattle, swine, sheep, horses,	In cattle, mastitis, diarrhea, vaginal discharge,	causes unsatisfactory growth in

	chickens, turkeys	and aborted fetuses	chickens
cryptococcosis	cattle, swine, horses	chronic mastitis in cattle, decreased milk flow and appetite loss	also affects dogs and cats
histoplasmosis	horses cattle and swine	(in dogs) chronic cough, loss of appetite, weakness, depression, diarrhea, extreme weight loss	also affects dogs; actively grows and multiplies in soil and remains active long after birds have departed
PROTOZOAL			
Coccidiosis	poultry, cattle, and sheep	bloody diarrhea in chickens, dehydration, retardation of growth	almost always present in English sparrows; also found in pigeons and starlings
American trypanosomiasis	infection of mucous membranes of eyes or nose, swelling	possible death in 2-4 weeks	caused by the conenose bug found on pigeons
toxoplasmosis	cattle, swine, horses, sheep, chickens, turkeys	In cattle, muscular tremors, coughing, sneezing, nasal discharge, frothing at the mouth, prostration and abortion	also affects dogs and cats
RICKETTSIAL/CHLAMYDIAL			
chlamydiosis	cattle, horses, swine, sheep, goats, chickens, turkeys, ducks, geese	In cattle, abortion, arthritis, conjunctivitis, enteritis	also affects dogs and cats and many wild birds and mammals
Q fever	affects cattle, sheep, goats, and poultry	may cause abortions in sheep and goats	can be transmitted by infected ticks

Figure 2. Diseases of livestock linked to feral pigeons, starlings, blackbirds, and House Sparrows (*taken from Weber 1979*).

1.3.4 Need for BDM to Protect Agricultural Crops

Migratory and resident geese can cause considerable damage to crops, particularly winter wheat. Wheat is a major crop in Kansas, not only for the production of grain, but also as a winter grazing forage for livestock (KASS 2016). The overall populations of many species of geese in North America have experienced a drastic increase over the last few years (Cleary and Dolbeer 1999). Large goose flocks often congregate on winter wheat fields to feed and take advantage of the large open spaces that the fields offer as a safety strategy. Damage to the wheat crop during feeding by geese can be quite extensive; geese often pluck younger plants from the ground during feeding rather than clipping off the vegetative portion of the plant.

Several studies have shown that blackbirds and starlings can pose a significant economic threat to agricultural producers (Besser et al. 1968, Dolbeer et al. 1978, and Feare 1984). Studies have shown that blackbirds have caused damages ranging from \$4 to \$11 million to sunflower crops in North Dakota, South Dakota, and Minnesota annually. On occasion, blackbirds have destroyed entire fields of sunflowers in a few days. During the fall and winter months, the natural migration patterns of blackbirds concentrate large numbers of blackbirds in Kansas and is cause for concern for among sunflower and grain sorghum producers (Kansas ranked 5th and 1st in production respectively) (Kansas Department of Agriculture 2016). Kansas farmers produced over half of the nation's grain sorghum crop and sunflower production is expected to increase in the near future (KDA 2016).

Kansas pecan groves are typically located in the southeast corner of the state especially in the Neosho and Verdigris River Valleys. Kansas pecan growers produce 3 million pounds (Dr. William Reid, KSU, pers. comm. 2005) annually. Many pecan producers lose a portion of their crop each year to migratory and resident American crows (*Corvus brachyrhynchos*) and blue jays (*Cyanocitta cristata*). From the time the pecans first ripen, as early as late summer, until they are harvested in the fall or winter, pecan nuts are vulnerable to shell cracking, feeding, or caching by crows and jays.

1.3.5 Need for BDM to Protect Property

Property Damage to Aircraft from Bird Strikes

Collisions between aircraft and wildlife are a concern throughout the world because wildlife strikes threaten passenger safety (Thorpe 1996), result in lost revenue, and repairs to aircraft can be costly (Linnell et al. 1996, Robinson 1996). Aircraft collisions with wildlife can also erode public confidence in the air transportation industry as a whole (Conover et al. 1995). Wildlife strikes pose increasing risks and economic losses to the aviation industry worldwide. Annual economic losses from wildlife strikes with civil aircraft are conservatively estimated to exceed \$1.2 billion worldwide (Allan 2002). Direct costs include damage to aircraft, aircraft downtime, and medical expenses of injured personnel and passengers. Indirect costs can include lost revenue from the flight, cost of housing delayed passengers, rescheduling aircraft, and flight cancellations.

From 1990 to 2015, Federal Aviation Administration (FAA) records indicate total reported losses from bird strikes cost the civil aviation industry over \$666 million in monetary losses and 632,361 hours of aircraft downtime (Dolbeer et al. 2016). These figures may be an underestimate of total damage because the number of actual bird strikes is likely to be much greater than that reported. An estimated 80% of civil bird strikes may go unreported (Linnell et al. 1999, Wright and Dolbeer 2005). Between 2004 and 2008, Dolbeer (2009) estimated the FAA received reports on only 39% of the actual aircraft strikes; therefore, 61% of aircraft strikes went unreported. However, Dolbeer et al. (2016) estimated that nearly 91% of civil wildlife strikes are now being reported. Not all reports provide notation as to whether or not there was damage and some strike reports to the FAA that indicate there was an adverse impact on the aircraft from the strike do not include a monetary estimate of the damage caused. Additionally, most reports indicating damage to aircraft report direct damages and do not include indirect damage, such as lost revenue, cost of putting passengers in hotels, rescheduling aircraft, and flight cancellations. Dolbeer et al. (2014) estimated that the actual annual costs to the United States civil aviation industry from wildlife strikes to be over 588,699 hours of aircraft downtime and \$937 million in losses.

Birds can present a safety threat to aviation when those species occur in areas on and around airports. Species of birds that occur in large flocks or flight lines entering or exiting a roost at or near airports or when present in large flocks foraging on airport property can result in aircraft strikes involving several individuals of a bird species, which can increase damage and increase the risks of catastrophic failure of the aircraft. A high percentage of bird strikes occur during peak migration periods, but dangerous situations can develop during any season. Aircraft are most vulnerable to bird strikes while at low altitudes, generally related to landing and taking off. From 1990 through 2015, approximately 73% of reported bird strikes to general aviation aircraft in the United States occurred when the aircraft was at an altitude of 500 feet above ground level or less. Additionally, approximately 97% occurred less than 3,500 feet above ground level (Dolbeer et al. 2016).

From January 2010 through November 2018, the FAA (2017) has reports of aircraft striking up to 388 birds in Kansas. In Kansas, over 99% of the reported aircraft strikes from January 2010 through November 2019 involved birds (FAA 2017).

DeVault et al. (2011) concluded that Snow Geese (*Anser caerulescens*), duck species, Canada Geese, Turkey Vultures, Double-crested Cormorants (*Phalacrocorax auritus*), Brown Pelicans (*Pelecanus occidentalis*), Sandhill Cranes (*Antigone canadensis*), and Wild Turkeys (*Meleagris gallopavo*) were among the top ten most hazardous birds to aircraft. Those hazards were based upon the number of strikes involving those birds, the amount of damage strikes involving those birds have caused to aircraft, the

effect on the flight after the strike, and the body mass the bird (DeVault et al. 2011). Dolbeer et al. (2016) found the most common bird species involved in strikes reported to the FAA (when identification of the bird species occurred) from 1990 to 2015 were pigeons/doves (14%), followed by raptors (13%), gulls (12%), shorebirds (9%), and waterfowl (6%). Waterfowl were responsible for 29% of the damage occurring in which the bird type was identified (Dolbeer et al. 2016). When struck, 25% of the reported gull strikes resulted in damage to the aircraft or had a negative effect on the flight while 62% of the reported waterfowl strikes resulted in damage or negative effects on the flight compared to 40% of strikes involving raptors/vultures and 9% of strikes involving pigeons and doves (Dolbeer et al. 2015).

Since 1990, over \$243 million in damage and economic losses to civil aircraft have been reported from strikes involving waterfowl (Dolbeer et al. 2016). Nearly 1,600 aircraft strikes have occurred in the United States since 1990 that involved Canada Geese with over \$127 million in damages and economic losses to aircraft reported from those strikes (Dolbeer et al. 2016). Aircraft strikes involving herons, bitterns, and egrets have resulted in nearly \$15 million in damages to aircraft (Dolbeer et al. 2016). In total, aircraft strikes involving birds has resulted in over \$600 million in reported damages and economic losses to civil aircraft since 1990 in the United States (Dolbeer et al. 2016). Nationally, the resident Canada Goose population probably represents the single most serious bird threat to aircraft safety (Alge 1999, Seubert and Dolbeer 2004, Dolbeer and Seubert 2006).

Resident Canada Geese are of particular concern to aviation because of their large size (typically 8 to 15 pounds, which exceeds the four pound bird certification standard for engines and airframes); flocking behavior (which increases the likelihood of multiple bird strikes); attraction to airports for grazing; and year-around presence in urban environments near airports (Seubert and Dolbeer 2004). From 1990 through 2015, there were 1,584 reported strikes involving Canada Geese in the United States, including Florida, resulting in over \$127 million in damage and associated costs to civil aircraft (Dolbeer et al. 2016). The threat that Canada Geese pose to aircraft safety was dramatically demonstrated in January 2009 when United States Airways Flight 1549 made an emergency landing in the Hudson River after ingesting multiple Canada Geese into both engines shortly after takeoff from New York's LaGuardia Airport (Wright 2014, Dolbeer et al. 2015). Although the aircraft was destroyed after sinking in the river, all 150 passengers and 5 crewmembers survived (Wright 2014). In addition to civil aviation, the United States Air Force (USAF) reports that Canada Geese have caused over \$90 million in damage to aircraft (USAF 2016).

Raptors, as well as vultures, present a risk to aircraft because of their large body mass and slow-flying or soaring behavior. Of the total known birds struck in the United States from 1990 through 2015, raptors accounted for 13% of reported strikes and 21% of the damage (Dolbeer et al. 2016). Aircraft have struck numerous raptors and vultures in the state from January 1990 through August 2016, including American Kestrels (*Falco sparverius*), Bald Eagles (*Haliaeetus leucocephalus*), Northern Harriers (*Circus cyaneus*), Osprey (*Pandion haliaetus*), Red-shouldered Hawks (*Buteo lineatus*), Cooper's Hawks (*Accipiter cooperii*), Red-tailed Hawks (*Buteo jamaicensis*), Sharp-shinned Hawk (*Accipiter striatus*), Broad-winged Hawks (*Buteo platypterus*), Peregrine Falcons (*Falco peregrinus*), Mississippi Kites (*Ictinia mississippiensis*), Swallow-tailed Kites (*Elanoides forficatus*), Barred Owls (*Strix varia*), Black Vultures (*Coragyps atratus*), and Turkey Vultures (*Cathartes aura*) (FAA 2017). Raptors and vultures have a large body size making them capable of causing substantial damage to aircraft. Vultures are one of the most hazardous bird groups for an aircraft to strike based on the frequency of strikes, effect on flight, and amount of damage caused by vultures throughout the country (DeVault et al. 2011, Dolbeer et al. 2016).

Starlings and blackbirds, when in large flocks or flight lines entering or exiting a winter roost at or near airports, present a safety threat to aviation. Starlings and blackbirds are particularly dangerous birds to aircraft during take-offs and landings because of their high body density and tendency to travel in large flocks of hundreds to thousands of birds (Seamans et al. 1995). Mourning Doves (*Zenaidura macroura*)

also present similar risks when their late summer behaviors include creating large roosting and loafing flocks. Their feeding, watering, and gritting behavior on airport turf and runways further increase the risks of bird-aircraft collisions. Gulls also present a strike risk to aircraft and congregate on Kansas airport runways after a rain to feed on earthworms and are a major concern.

Other Property Damage Associated with Birds

In addition to damage caused by the accumulation of droppings, damage can also occur in other ways. Electrical utility companies frequently have problems with birds and bird droppings causing power outages by shorting out transformers and substations. The nesting behavior of some bird species can also cause damage to property. Nesting material can be aesthetically displeasing and fecal droppings often accumulate near nests, which can also be aesthetically displeasing.

WS-Kansas has conducted many BDM projects to protect property. An example of one project involved excessive pigeon droppings at several power plants. Two power stations in the Kansas City area spent \$183,250 on pigeon waste removal between the years 1995-2002 (Sarah Steinger, BPU, Kansas City, pers. comm. 2005). Electrical utility companies frequently have problems with birds and other animals causing power outages by shorting out transformers and substations. These power outages can be a major financial burden for utility companies and cooperatives. The estimated cost to restore power to just one manufacturing plant, an Owens Corning facility in Kansas City, is \$100,000 (Sarah Steinger, BPU Kansas City, pers. comm. 2005). These problems are not only from the direct activities of nesting and roosting birds at substations; snakes are attracted to these areas due to the high concentration of prey items such as eggs and young birds. As snakes depredate nests they inadvertently cross high voltage lines and cause power outages (James et al. 1999). In addition, utility towers are sometimes used by turkey vultures for roosting where they, as well as other flocking birds such as starlings and crows, can cause similar damage problems.

Feral domestic and wild waterfowl sometimes congregate at golf courses, parks, and other recreational areas that have ponds or watercourses and cause damage by grazing on turf and the accumulation of droppings. Economic damage can occur from the need to cleanup parking lots, public use areas, sidewalks, patios, and lawns at business, residential, and recreational locations. For example, costs can be associated with restoration of greens and other turf areas, cleanup of human use areas, and lost revenue from the loss of memberships at a golf course. Members and the club's management can also be concerned about the possible health hazards from exposure to fecal droppings. The accumulation of fecal matter from birds can also negatively affect landscaping and walkways, often at golf courses and water front property (Conover and Chasko 1985). The costs of reestablishing overgrazed lawns and cleaning waterfowl feces from sidewalks have been estimated at more than \$60 per bird (Allan et al. 1995).

A golf course manager reported \$2,000 in damages to golf greens and fairway turf from the feeding activities of a small flock of resident Canada Geese in 2007. Small to large flocks of up to 400 Canada Geese are common at golf courses and housing developments throughout Kansas.

Birds occasionally damage structures on private property or public facilities with fecal contamination. Accumulated bird droppings can reduce the functional life of some building roofs by 50% (Weber 1979). Woodpeckers sometimes cause structural damage to wood siding and stucco on homes. Corrosion damage to metal structures and painted finishes, including those on automobiles and aircraft, can occur because of uric acid from bird droppings. Several incidents involving bird droppings on vehicles, equipment, and aircraft in storage buildings at airports and airbases have created concern.

Rookeries, or nesting colonies, are established by egret and heron species, including Cattle Egrets (*Bubulcus ibis*), Great Egrets (*Casmerodius albus*), Little Blue Herons (*Egretta caerulea*), and Snowy Egrets (*Egretta thula*), throughout Kansas. These nesting sites can encompass areas between 0.1 and 5 ha in size. Egret activities can be destructive to desirable trees, shrubs and other vegetation at these sites. Defoliation of the plants by bird movements through the canopy, removal of plant material for nest building, covering of leaves by droppings, and drastic increases in soil nutrients from bird droppings will destroy the vegetative community in 1-12 years, depending on the plant species present (Telfair and Thompson 1986, Telfair 2006).

1.3.6 Need for BDM to Protect Aquaculture

Kansas aquaculture had \$4,997,000 in total aquaculture sales in 2012 (National Agricultural Statistics Service 2017). Most aquaculture in the state, though, consists largely of management agencies such as the Kansas Department Wildlife, Parks and Tourism (KDWPT). Occasionally, fish-eating birds such as herons, egrets, Double-crested Cormorants, Herring Gulls, Ring-billed Gulls (*Larus delawarensis*), Ospreys, and other piscivorous bird species prey on young fry, fingerlings, adult fish ready for stocking, or brood fish at these fish rearing facilities. Although not a widespread problem in the State, WS-Kansas could be requested to assist in resolving such problems. In most cases, WS-Kansas only provides advice (technical assistance) to the facility operators on how to resolve such problems through primarily nonlethal means such as barriers, deterrent wires, or harassment. In some cases, the producer or facility might need to obtain a depredation permit from the U. S. Fish and Wildlife Service (USFWS) to kill a few of the birds to reinforce the remaining birds' fear of harassment and exclusionary techniques. Under the proposed action, WS-Kansas could also be requested to provide on-site operational assistance involving the use of nonlethal and lethal means of resolving bird damage problems at these or similar facilities. Lethal methods would generally be restricted to taking only a few birds to reinforce the remaining birds' fear of harassment and exclusionary techniques.

1.3.7 Need for BDM to Protect Natural Resources

Birds can also negatively affect natural resources through habitat degradation, competition with other wildlife, and through direct depredation on natural resources. Habitat degradation can occur when large concentrations of birds in a localized area negatively affect characteristics of the surrounding habitat, which can adversely affect other wildlife species and can be aesthetically displeasing. Competition can occur when two species compete (usually to the detriment of one species) for available resources, such as food or nesting sites. Direct depredation occurs when predatory bird species feed on other wildlife species, which can negatively influence those species' populations, especially when depredation occurs on threatened and endangered (T&E) species.

For example, brood parasitism by Brown-headed Cowbirds (*Molothrus ater*) has become a concern for many wildlife professionals where those birds are plentiful. Somewhat unique in their breeding habits, Brown-headed Cowbirds are known as brood parasites, meaning they lay their eggs in the nests of other bird species (Lowther 1993). Female cowbirds can lay up to 40 eggs per season with eggs reportedly being laid in the nests of over 220 species of birds (Lowther 1993). No parental care is provided by cowbirds with the raising of cowbird young occurring by the host species. Young cowbirds often out-compete the young of the host species (Lowther 1993). Due to this, Brown-headed Cowbirds can have adverse effects on the reproductive success of other species (Lowther 1993) and can threaten the viability of a population or even the survival of a host species (Trail and Baptista 1993).

European Starlings and House Sparrows can be aggressive and often out-compete native species, destroying their eggs, and killing nestlings (Cabe 1993, Lowther and Cink 2006). Miller (1975) and Barnes (1991) reported European Starlings were responsible for a severe depletion of the Eastern Bluebird (*Sialia sialis*) population due to nest competition. Nest competition by European Starlings have been known to displace American Kestrels (Von Jarchow 1943, Nickell 1967, Wilmer 1987, Bechard and Bechard 1996), Red-bellied Woodpeckers (*Melanerpes carolinus*), Gila Woodpeckers (*Melanerpes uropygialis*) (Kerpez and Smith 1990, Ingold 1994), Northern Flickers (*Colaptes auratus*), Purple Martins (*Progne subis*) (Allen and Nice 1952), and Wood Ducks (*Aix sponsa*) (Shake 1967, McGilvery and Uhler 1971, Grabill 1977, Heusmann et al. 1977). Weitzel (1988) reported nine native species of birds in Nevada had been displaced by starling nest competition, and Mason et al. (1972) reported European Starlings evicting bats from nest holes.

Crows and gulls will consume a variety of food items, including the eggs and chicks of other birds (Good 1998, Verbeek and Caffrey 2002, Pollet et al. 2012, Burger 2015, Nisbet et al. 2017). Those species in particular are among the most frequently reported avian predator of colonial nesting waterbirds in the United States (Frederick and Collopy 1989). Predation is a naturally occurring event but can become a management concern when predation occurs on species experiencing severe population declines or during the restoration of waterbird breeding sites (Hunter et al. 2006). Fish eating birds, such as cormorants, egrets, herons, and osprey, also have the potential to impact fish and amphibian populations, especially those of T&E species. Impacts on the productivity and survivorship of rare or threatened wildlife can be severe when they become targets of avian predators. Some of the species listed as threatened or endangered under the Endangered Species Act of 1973 (ESA) are preyed upon or otherwise could be adversely affected by certain bird species.

For example, Herring Gulls (*Larus argentatus*) and Great Black-backed Gulls (*Larus marinus*) are aggressive predators on many species (Guillemette and Brousseau 2001, Hunter et al. 2006), including being major predators of tern, skimmers, and oystercatchers (Hunter et al. 2006). Studies conducted in Virginia found Herring Gulls and Great Black-backed Gulls to be efficient predators on tern and Black Skimmer (*Rynchops niger*) eggs, chicks, and fledglings (Becker 1995, O'Connell and Beck 2003). Fledgling success rates for Common Terns (*Sterna hirundo*) ranged from zero to 19% when nesting adjacent to a Herring Gull colony because gulls preyed on 44% to 94% of the chicks (Becker 1995). In another study, Herring Gulls preyed on 61% to 66% of Common Tern (*Sterna hirundo*) chicks in a colony (O'Connell and Beck 2003). Common Grackles, Red-winged Blackbirds, Northern Harriers, and American Kestrels are also known to feed on nesting colonial water birds and shorebirds, their chicks and/or eggs (Hunter and Morris 1976, Faraway et al. 1986, Rimmer and Deblinger 1990, Ivan and Murphy 2005, United States Army Corps of Engineers 2009).

Colonial nesting species can also compete with other bird species for nest sites. For example, gulls and cormorants can displace other colonial nesting birds (Gochfeld and Burger 1994, Hunter et al. 2006). Kress et al. (1983) found that efforts to remove Herring Gulls and Great Black-backed Gulls in the northeastern United States were successful in restoring tern nesting sites and increasing productivity at active tern nesting sites. The Southeastern United States Regional Waterbird Conservation Plan stated that Herring Gulls and Great Black-backed Gulls "...have increased dramatically in the Southeast U.S. and [Herring Gulls and Great Black-backed Gulls] are considered to be important predators on other coastal nesting waterbirds..." (Hunter et al 2006).

Additionally, degradation of vegetation due to the presence of colonial nesting birds can reduce nesting habitat for other birds (Jarvie et al. 1997, Shieldcastle and Martin 1999) and wildlife, including T&E species (Korfanty et al. 1999). In some cases, the establishment of colonial waterbird nesting colonies on islands has led to the complete denuding of vegetation within 3 to 10 years of areas being occupied (Lewis 1929, Lemmon et al. 1994, Weseloh and Ewins 1994, Bédard et al. 1995, Weseloh and Collier

1995, Weseloh et al. 1995, Korfanty et al. 1999, Hebert et al. 2005). Cormorants can have a negative effect on vegetation that provides nesting habitat for other birds (Jarvie et al. 1997, Shieldcastle and Martin 1999) and wildlife, including state and federally listed T&E species (Korfanty et al. 1999). Hebert et al. (2005) noted that ammonium toxicity caused by an accumulation of fecal droppings from Double-crested Cormorants might be an important factor contributing to the declining presence of vegetation on some islands in the Great Lakes. Cuthbert et al. (2002) found that cormorants have a negative effect on normal plant growth and survival on a localized level in the Great Lakes region.

Based on survey information provided by Wires et al. (2001), biologists in the Great Lakes region reported cormorants as having an impact to herbaceous layers and trees where nesting occurred. Damage to trees was mainly caused by fecal deposits, and resulted in tree die off at breeding colonies and roost sites. Impacts to the herbaceous layer of vegetation were also reported due to fecal deposition, and often this layer was reduced or eliminated from the colony site. In addition, survey respondents reported that the impacts to avian species from cormorants occurred primarily from habitat degradation and from competition for nest sites (Wires et al. 2001). Although loss of vegetation can have an adverse effect on many species, some colonial waterbirds such as pelicans and terns prefer sparsely vegetated substrates.

Damage to vegetation can also occur when birds strip leaves for nesting material or when the weight of many nests, especially those of colonial nesting waterbirds breaks branches (Weseloh and Ewins 1994). In some cases, those effects can be so severe on islands that all woody vegetation is eliminated, which can leave those islands completely denuded of vegetation (Cuthbert et al. 2002). Lewis (1929) considered the killing of trees by nesting cormorants to be local and limited, with most trees having no commercial timber value. However, tree damage may be perceived as a problem if those trees are rare species, or aesthetically valued (Bédard et al. 1999, Dorr et al. 2014).

Large concentrations of waterfowl may affect water quality around beaches and in wetlands by acting as nonpoint source pollution. For example, nutrient loading has been found to increase in wetlands in proportion to increases in the numbers of roosting geese (Manny et al. 1994, Kitchell et al. 1999). In studying the relationship between bird density and phosphorus and nitrogen levels in Bosque Del Apache National Wildlife Refuge in New Mexico, Kitchell et al. (1999) found an increase in the concentration of both phosphorus and nitrogen correlated with an increase in bird density. Scherer et al. (1995) stated that waterfowl metabolize food very rapidly and most of the phosphorus contributed by bird feces into water bodies probably originates from sources within a lake being studied. In addition, assimilation and defecation converted the phosphorus into a more soluble form; therefore, the phosphorus from fecal droppings was considered a form of internal loading. Waterfowl can contribute substantial amounts of phosphorus and nitrogen into lakes through feces, which can cause excessive aquatic macrophyte growth and algae blooms (Scherer et al. 1995) and accelerated eutrophication through nutrient loading (Harris et al. 1981).

Canada Geese and other waterfowl can be attracted to waste water treatment plants because of the water and available vegetation. Sewage treatment plants are often required to test water quality of effluents before release from finishing ponds into the environment. Coliform bacteria causes acidic pH levels in the water and lowers dissolved oxygen, which can kill aquatic organisms (Cagle 1998). In addition, fecal contamination increases nitrogen levels in the pond resulting in algae blooms. Oxygen levels are depleted when the algae dies resulting in the death of aquatic invertebrates and vertebrates.

Birds can carry a wide range of bacterial, viral, fungal, and protozoan diseases that can affect other bird species, as well as mammals. A variety of diseases that birds can carry can affect natural resources (*e.g.*, see Friend and Franson 1999, Forrester and Spalding 2003, Thomas et al. 2007). Potential impacts from diseases found in wild birds may include transmission to a single individual or a local population, transmission to a new habitat, and transmission to other species of wildlife including birds, mammals,

reptiles, amphibians, and fish species. Birds may also act as a vector, reservoir, or intermediate host as it relates to diseases and parasites. Diseases like avian botulism, avian cholera, and Newcastle disease can account for the death of hundreds to thousands of bird species across the natural landscape (Friend et al. 2001). For example, an avian botulism outbreak in Lake Erie was responsible for a mass die-off of Common Loons (*Gavia immer*) (Campbell et al. 2001) as well as other species that may have fed on the carcasses or on fly larva associated with the carcasses (Duncan and Jensen 1976). Although diseases spread through populations of birds, it is often difficult to determine the potential impacts they will have on other wildlife species due to the range of variables that are involved in a disease outbreak (Friend et al. 2001).

Wild and domestic waterfowl, as well as a variety of other bird species, are the acknowledged natural reservoirs for a variety of avian influenza viruses (Davidson and Nettles 1997, Alexander 2000, Stallknecht 2003, Pedersen et al. 2010). Avian influenza (AI) circulates among these birds without clinical signs and is not an important mortality factor in wild waterfowl (Davidson and Nettles 1997, Clark and Hall 2006). However, the potential for AI to produce devastating disease in domestic poultry makes its occurrence in waterfowl an important issue (Davidson and Nettles 1997, Clark and Hall 2006, Gauthier-Clerc et al. 2007). Although low pathogenic strains of AI are often found in wild birds (Stallknecht 2003, Pedersen et al. 2010), high pathogenic strains have also been found to exist in wild waterfowl species (Brown et al. 2006, Keawcharoen et al. 2008). The ability for wild birds to carry these highly pathogenic strains increases the potential for transmission to domestic poultry facilities, which are highly susceptible to high pathogenic strains of AI (Nettles et al. 1985, Gauthier-Clerc et al. 2007, Pedersen et al. 2010). The potential impacts from a severe outbreak of high pathogenic AI in domestic poultry could be devastating, and possibly cripple the multi-billion dollar industry through losses in trade, consumer confidence, and eradication efforts (Pedersen et al. 2010).

Any disease introduction into domestic poultry could have economic impacts that are far-reaching. Some diseases that could affect the poultry industry in Florida and might originate in wild bird species include exotic Newcastle disease, chlamydiosis, high-pathogenic AI, low-pathogenic AI, salmonellosis, and pasteurellosis (Clark and McLean 2003). A single outbreak of high-pathogenic AI in 1984 cost the poultry industry \$63 million in destroyed or sick birds and clean-up costs, and the price of poultry food products rose in the six months following the outbreak (Hahn and Clark 2002). When adjusted for inflation, those costs would be the equivalent to nearly \$1 billion in 2003 (Clark 2003). Similarly, a low-pathogenic strain of AI virus was isolated in Virginia in March 2002. The control and containment efforts cost \$13 million in destruction of flocks, \$50 million in paid indemnities, and an overall cost of \$129 million to the industry in an effort to minimize the trade impacts (Hahn and Clark 2002). Genetic evidence and documented temporal associations between AI prevalence in wild waterfowl and poultry flocks suggests that wild waterfowl can be a source of infection to poultry (Clark 2003, Clark and Hall 2006). In samples of over 260,000 wild birds, the prevalence of low-pathogenic AI across the United States in 2007 and 2008 was 9.7 and 11%, respectively and the prevalence of high-pathogenic AI in the same years was 0.5 and 0.06%, respectively (Deliberto et al. 2009). The majority of those wild birds were dabbling ducks, geese, swans, and shorebirds (Deliberto et al. 2009).

Newcastle disease is a contagious viral disease that can infect birds, which is caused by the virulent avian paramyxovirus serotype 1. More than 230 species of birds have been determined to be susceptible to natural or experimental infections with avian paramyxoviruses, but in most cases were asymptomatic. In wild birds, the effects appear to vary depending on the species of bird and the virulence of the particular strain of avian paramyxovirus. Newcastle disease can cause high rates of mortality in some bird populations, such as Double-crested Cormorants, but often show little effect on other species (Glaser et al. 1999), although poultry have been found to be highly susceptible (Docherty and Friend 1999, Alexander and Senne 2008). Other species may carry avian paramyxoviruses, including pigeons, which because of their use of agricultural settings and possible interactions with livestock, may pose a risk of transmission

(Kommers et al. 2001). USDA WS and VS are currently working to quarantine and depopulate an area in southern California that is experiencing a virulent Newcastle disease outbreak.

As the population of Double-crested Cormorants has increased, so has concern for sport fishery populations. Cormorants may have a negative effect on recreational fishing on a localized level. Recreational fishing benefits local and regional economies in many areas of the United States, with some local economies relying heavily on income associated with recreational fisheries. The collapse of sport fisheries can have negative economic impacts on businesses and can result in job losses (Shwiff and DeVault 2009). For example, when the walleye (*Sander vitreus*) and yellow perch (*Perca flavescens*) fishery collapsed on Oneida Lake in New York after the colonization of the lake by cormorants (VanDeValk et al. 2002, Rudstam et al. 2004), research biologists with the National Wildlife Research Center (NWRC) sought to identify the actual monetary damage associated with the declines of those sport fish populations. The total estimated revenue lost in the Oneida Lake region from 1990 to 2005 due to declines in the sport fisheries on the lake ranged from \$122 million to \$539 million. That lost revenue from the collapse of the fisheries resource resulted in the loss of 3,284 to 12,862 jobs in the Oneida Lake region from 1990 to 2005 (Shwiff and DeVault 2009). In 1998, the WS program in New York was requested to assist with managing damage associated with cormorants on Oneida Lake. Cormorant damage management activities conducted on Oneida Lake from 1998 to 2005 prevented the loss of an estimated \$48 million to \$171 million in revenue, which allowed between 1,446 and 5,014 jobs to be retained in the Oneida Lake region (Shwiff and DeVault 2009).

The degree to which cormorant predation affects sport fishery populations in a given body of water is dependent on a number of variables, including the number of birds present, the time of year at which predation is occurring, prey species composition, and physical characteristics such as depth or proximity to shore (which affect prey accessibility). In addition to cormorant predation, environmental and human-induced factors affect aquatic ecosystems. Those factors can be classified as biological/biotic (e.g., overexploitation, exotic species), chemical (e.g., water quality, nutrient and contaminant loading), or physical/abiotic (e.g., dredging, dam construction, hydropower operation, siltation). Such activities may lead to changes in species density, diversity, and/or composition due to direct effects on year class strength, recruitment, spawning success, spawning or nursery habitat, and/or competition (USFWS 1995).

1.4 NATIONAL ENVIRONMENTAL POLICY ACT AND WS' DECISION-MAKING

All federal actions are subject to the NEPA (Public Law 9-190, 42 USC 4321 et seq.), including the actions of WS³. The NEPA sets forth the requirement that all federal actions be evaluated in terms of their potential to significantly affect the quality of the human environment for the purpose of avoiding or, where possible, mitigating and minimizing adverse impacts. In part, the Council of Environmental Quality (CEQ) regulates federal activities affecting the physical and biological environment through regulations in 40 CFR 1500-1508. The NEPA and the CEQ guidelines generally outline five broad types of activities that a federal agency must accomplish as part of projects they conduct. Those five types of activities are public involvement, analysis, documentation, implementation, and monitoring.

³The WS program follows the CEQ regulations implementing the NEPA (40 CFR 1500 et seq.) along with USDA (7 CFR 1b) and APHIS Implementing Guidelines (7 CFR 372) as part of the decision-making process.

Pursuant to the NEPA and the CEQ regulations, WS is preparing this EA⁴ to document the analyses associated with proposed federal actions and to inform decision-makers and the public of reasonable alternatives capable of avoiding or minimizing adverse effects. This EA will serve as a decision-aiding mechanism to ensure that WS infuses the policies and goals of the NEPA and the CEQ into the actions of the WS program in Florida. This EA will also aid WS with clearly communicating the analysis of individual and cumulative impacts of proposed activities to the public. In addition, the EA will facilitate planning, promote interagency coordination, and streamline program management analyses between WS, the USFWS, and KDWPT⁵.

Individual wildlife damage management projects conducted by the WS program could be categorically excluded from further analysis under the NEPA, in accordance with APHIS implementing regulations for the NEPA (7 CFR 372.5(c), 60 FR 6000-6003). However, the purpose of this EA is to evaluate cumulatively the individual projects that WS could conduct to manage the damage and threats that birds cause. More specifically, the EA will assist WS with determining if alternative approaches to managing bird damage could potentially have significant individual and/or cumulative effects on the quality of the human environment that would warrant the preparation of an Environmental Impact Statement (EIS)⁶ in compliance with the NEPA and CEQ regulations.

1.5 DECISION TO BE MADE

Management of migratory birds is the responsibility of the USFWS. As the authority for the overall management of migratory bird populations, the USFWS was involved in the development of the EA and provided information during the EA preparation process to ensure an interdisciplinary approach according to the NEPA and agency mandates, policies, and regulations. KDWPT is responsible for managing wildlife in the State of Kansas, including birds. KDWPT establishes and enforces regulated hunting seasons in the state, including the establishment of hunting seasons that allow the harvest of some of the bird species addressed in this EA. For some migratory bird species (*e.g.*, waterfowl), KDWPT can establish hunting seasons for those species under frameworks determined by the USFWS.

WS' activities to reduce and/or prevent bird damage in the state would be coordinated with the USFWS and KDWPT, which would give those agencies an opportunity to incorporate WS' actions into population objectives established by those agencies for bird populations in the state. The take of many of the bird species addressed in this EA could only occur when authorized by a depredation permit issued by the USFWS and/or KDWPT; therefore, the take of those bird species to alleviate damage or reduce threats of damage would only occur at the discretion of the USFWS and/or KDWPT.

Based on the scope of this EA, the decisions to be made are:

- Should BDM as currently implemented by WS-Kansas be continued in the State?
- If not, how should WS-Kansas fulfill its legislative responsibilities for managing bird damage in the State?
- What operating policies should be implemented to lessen identified potential impacts?

⁴The CEQ defines an EA as documentation that "...(1) briefly provides sufficient evidence and analysis for determining whether to prepare an [Environmental Impact Statement]; (2) aids an agency's compliance with NEPA when no environmental impact statement is necessary; and (3) facilitates preparation of an Environmental Impact Statement when one is necessary" (CEQ 2007).

⁵Section 1.6 of this EA discusses the roles, responsibilities, and the authorities of each agency.

⁶The EA process concludes with either a Finding of No Significant Impact or a determination to prepare an EIS. The CEQ states, "A Federal agency must prepare an EIS if it is proposing a major federal action significantly affecting the quality of the human environment" (CEQ 2007).

- Do WS-Kansas BDM activities have significant impacts requiring preparation of an EIS?

1.6 SCOPE OF THIS EA ANALYSIS

1.6.1 Actions Analyzed

This EA evaluates WS-Kansas BDM to protect human health and safety, agricultural resources, property, and natural resources on private or public lands throughout Kansas wherever such management is requested. This includes BDM for the protection of resources and bird management for monitoring and surveillance purposes.

1.6.2 American Indian Lands and Tribes

WS-Kansas only conducts BDM for Tribes at a Tribe's request. WS-Kansas has not been requested to provide assistance with BDM in Kansas on tribal lands. Since tribal lands are sovereign and the methods employed are the same as for any private land upon which WS-Kansas provides services, tribal officials determine if BDM is desired and the BDM methods allowed. Because tribal officials have the ultimate decision on whether BDM is conducted, no conflict with traditional cultural properties, or beliefs is anticipated. Therefore, this EA would cover BDM on tribal lands, where requested and implemented.

1.6.3 Federal Lands

Kansas has a number of different federal lands within its boundaries and WS-Kansas has been requested to conduct BDM on them (e.g., Fort Riley, Cimarron National Grasslands). The methods employed and potential impacts are the same on these lands as they would be on private lands upon which WS-Kansas provides service. Therefore, if WS-Kansas were requested to conduct BDM on federal lands for the protection of agriculture, property, human health and safety, or natural resources, this EA would cover the actions implemented provided that the impacts of BDM activities for such actions have been considered in this EA. NEPA compliance for BDM conducted to protect natural resources such as T&E species at the request of USFWS or other federal agency is the requesting agency's responsibility. However, WS-Kansas could accept the NEPA responsibility at the request of another agency, but that agency would still be responsible for issuing a NEPA Decision.

1.6.4 Period for which this EA is Valid

This EA will remain valid until WS-Kansas determines that new needs for action or new alternatives having different environmental effects must be analyzed. At that time, this analysis and document will be reviewed and revised as necessary. This EA will be reviewed each year to ensure that it is complete and still appropriate to the scope of the State BDM activities.

1.6.5 Site Specificity

This EA analyzes potential impacts of BDM on the human environment as required by NEPA and addresses WS-Kansas BDM activities on all lands under Cooperative Agreement or Agreements for

Control or as otherwise covered by WS-Kansas Work Plans (e.g., on federal public lands) within Kansas. It also addresses the impacts of BDM on areas where additional agreements with WS-Kansas may be written in the reasonably foreseeable future in Kansas. Because the proposed action is to continue the current BDM program, and because the current program's goal and responsibility is to provide service when requested within the constraints of available funding and manpower, it is conceivable that additional BDM efforts could occur. Thus, this EA anticipates potential expansion and analyzes the impacts of such expanded efforts as part of the current program.

Planning for BDM must be viewed as being conceptually similar to federal or other agency actions whose missions are to stop or prevent adverse consequences from anticipated future events for which the actual sites and locations where they will occur are unknown but could be anywhere in a defined geographic area. Examples of such agencies and programs include fire and police departments, emergency clean-up organizations, insurance companies, and other emergency response agencies. Although some of the sites where bird damage is likely to occur and lead to requests to WS-Kansas for assistance can be predicted, all specific locations or times where such damage will occur in any given year cannot be predicted. This EA emphasizes major issues as they relate to specific areas whenever possible; however, many issues apply wherever bird damage and resulting management occurs, and are treated as such.

The standard WS Decision Model (see WS Directive 2.201; Slate et al. 1992) would be the site-specific procedure for individual actions conducted by WS in the state (see Chapter 3 for a description of the Decision Model and its application). The WS Decision Model is an analytical thought process used by WS' personnel for evaluating and responding to requests for assistance. Decisions made using the model would be in accordance with WS' directives and policies described in this EA as well as relevant laws and regulations. In this way, WS believes it meets the intent of the NEPA with regard to site-specific analysis and that this is the only practical way for WS to comply with the NEPA and still be able to address damage and threats associated with birds.

The analysis in this EA considers impacts on target and nontarget wildlife species, people, pets, and the environment. Wildlife populations, with the exception of T&E species, are typically monitored over large geographic areas (i.e., the West, the State) and smaller geographic areas by the State Wildlife agency (i.e., KDWP game management units). WS-Kansas monitors target bird and nontarget take for Kansas and in each county. The game management units and counties do not correspond to each other in Kansas, thus, analysis of wildlife population impacts is better analyzed at the statewide level. Additionally, because most birds migrate, harvest is analyzed better at the statewide and regional levels. Waterfowl harvest by sportsmen in Kansas is estimated by KDWP and USFWS from mail surveys. Statistically, the variance at the local level (i.e., the game management unit or County) is very high and can be $\pm 100\%$ making the data not as useful. However, the variance is much lower at the statewide level and thus harvest data at the statewide level is much more reliable.

1.7 AUTHORITY AND COMPLIANCE

1.7.1 Authority of Federal and State Agencies for BDM in Kansas

1.7.1.1 WS Legislative Authority. USDA is authorized and directed by law to protect American agriculture and other resources from damage associated with wildlife. WS has legislative authority to conduct WDM in Kansas.

The primary statutory authorities for the APHIS-WS program are the Act of March 2, 1931 (46 Stat. 1468; 7 United States Code (USC) 426-426b) as amended, and the Act of December 22, 1987 (101 Stat.

1329-331, 7 USC 426c). The Act of March 2, 1931, as amended in the Fiscal Year 2001 Agriculture Appropriations Bill, provides that:

“The Secretary of Agriculture may conduct a program of wildlife services with respect to injurious animal species and take any action the Secretary considers necessary in conducting the program. The Secretary shall administer the program in a manner consistent with all of the wildlife services authorities in effect on the day before the date of the enactment of the Agriculture, Rural Development, Food and Drug Administration, and Related Agencies Appropriations Act, 2001.”

The Act of December 22, 1987 provides in part:

“That hereafter, the Secretary of Agriculture is authorized, except for urban rodent control, to conduct activities and to enter into agreements with States, local jurisdictions, individuals, and public and private agencies, organizations, and institutions in the control of nuisance mammals and birds and those mammals and birds species that are reservoirs for zoonotic diseases, and to deposit any money collected under any such agreement into the appropriation accounts that incur the costs to be available immediately and to remain available until expended for Animal Damage Control activities.”

WS-Kansas conducts WDM in cooperation with and under the authorities of KDA and KDWPT. WS-Kansas works cooperatively with local livestock associations and county governments to provide BDM assistance for its constituents. BDM assistance is provided statewide in areas where funding has been provided. BDM activities occur on both private and public lands as addressed in Section 1.6. The BDM methods that can be used in Kansas are discussed in Section 3.3 and in more detail in Appendix E, and each bird damage situations may require the use of one or more of these.

1.7.1.2 Kansas Department of Wildlife, Parks and Tourism (KDWPT). KDWPT is responsible for managing wildlife species, including birds, in the State under the authority of the Kansas Wildlife and Parks Commission (Kansas Statutes Annotated (KSA) 32-701-1127). Wildlife species under KDWPT authorities include game and nongame, and T&E species as authorized by USFWS. WS-Kansas maintains a statewide bird permit issued by KDWPT which regulates take of birds protected by state law. KDWPT also authorizes the use of chemical toxicants for controlling damaging bird species under a nuisance bird control permit.

1.7.1.3 Kansas Department of Agriculture (KDA). KDA has regulatory authority for the safe and proper use of pesticides in WDM (KSA 2-2453 and 2-2454), certification of applicators (KSA 2-2441a and 2-2445a), and product label registration (KSA 2-2201). Any use of pesticide products in BDM by WS-Kansas in the State would be subject to KDA regulatory requirements.

1.7.1.4 Kansas State University Cooperative Extension Service (KSU-CES). KSU-CES is directed to develop a statewide program for control of damage caused by wildlife (KSA 76-459-464). KSU-CES instructs farmers and ranchers on effective damage management methods to more effectively protect their crops, poultry, and livestock from wildlife damage. KSU-CES also conducts studies on WDM methods, especially focusing on nonlethal control methods, to prevent agricultural losses caused by wildlife and to supply individuals, at cost, with materials not readily available from local commercial sources for use in BDM.

1.7.1.5 U.S. Fish and Wildlife Service. USFWS is responsible for managing and regulating take of migratory bird species listed under the Migratory Bird Treaty Act. They are also responsible for

regulating T&E species under ESA. Sections 1.7.2.2 and 1.7.2.3 below describe WS' interactions with the USFWS under these two laws.

1.7.2 Compliance with Federal Laws

Several federal laws authorize, regulate, or otherwise affect WS-Kansas WDM activities. WS-Kansas complies with these laws and consults and cooperates with other agencies as appropriate.

1.7.2.1 National Environmental Policy Act. WS prepares analyses of the environmental impacts of program activities to meet procedural requirements of this law. This EA meets the NEPA requirement for the proposed action in Kansas. Most Federal actions are subject to NEPA (Public Law 91-190, 42 USC 4321 et seq.) and its implementing regulations established by the Council on Environmental Quality (40 CFR 1500-1508). In addition, WS follows USDA (7 CFR 1b) and APHIS (7 CFR 372) NEPA implementing regulations as a part of the decision-making process. When WS operational assistance is requested by another federal agency, NEPA compliance is the responsibility of the other federal agency.

1.7.2.2 Endangered Species Act. It is federal policy, under ESA, that all federal agencies shall seek to conserve T&E species and shall utilize their authorities in furtherance of the purposes of the Act (Sec.2(c)). WS conducts Section 7 consultations with USFWS to use the expertise of the USFWS to ensure that "any action authorized, funded or carried out by such an agency . . . is not likely to jeopardize the continued existence of any endangered or threatened species . . . Each agency shall use the best scientific and commercial data available . . ." (Sec.7(a)(2)). WS obtained an updated Biological Opinion (BO) from USFWS in 2015 describing potential effects on T&E species and prescribing reasonable and prudent measures for avoiding jeopardy (USDA 2015, Appendix F).

1.7.2.3 Migratory Bird Treaty Act. The Migratory Bird Treaty Act of 1918 (16 USC 703-711; 40 Stat. 755), as amended, provides the USFWS regulatory authority to protect species of birds that migrate outside the United States. The law prohibits any "take" of bird species, eggs and nests and possession of birds or bird parts by private entities, except as permitted by the USFWS; therefore, the USFWS issues permits to private and public entities for reducing bird damage. Executive Order 13186 requires each federal agency taking actions that have, or are likely to have, a measurable negative effect on migratory bird populations to develop and implement a Memorandum of Understanding (MOU) with the USFWS that shall promote the conservation of migratory bird populations. APHIS has developed a MOU in 2012 with the USFWS as required by this Executive Order and WS would abide by the MOU.

WS-Kansas may provide on-site assessments for persons experiencing migratory bird damage to obtain information on which to base BDM recommendations. BDM recommendations could be in the form of technical assistance or operational assistance. When appropriate, WS-Kansas may provide recommendations to the USFWS for the issuance of depredation permits to private entities to resolve a bird damage problem. The ultimate responsibility for issuing such permits rests with the USFWS (50 CFR 21.41). Starlings, feral domestic pigeons, House Sparrows, and domestic waterfowl are not classified as protected migratory birds and therefore have no protection under this Act. USFWS depredation permits are not required to kill blackbirds, cowbirds, all grackles, crows, or magpies in Kansas found committing or about to commit depredation upon ornamental or shade trees, agricultural crops, livestock, or wildlife, or when concentrated in such numbers and manner as to constitute a health hazard or other nuisance. Based on evidence that migratory game birds have accumulated in such numbers to threaten or damage agriculture, horticulture or aquaculture, the Director of the USFWS is authorized to issue a depredation order to permit the killing of such birds (50 CFR 21.42-47).

1.7.2.4 Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). FIFRA requires the registration, classification, and regulation of all pesticides used in the United States. The Environmental Protection Agency (EPA) is responsible for implementing and enforcing FIFRA. All chemical methods used or recommended by WS-Kansas are registered with and regulated by the EPA and KDA, and are used by WS-Kansas in compliance with labeling procedures and requirements.

1.7.2.5 Food, Drug, and Cosmetic Act. This Act, as amended, gives the Food and Drug Administration (FDA) the authorization to regulate the study and use of animal drugs. FDA regulates A-C and other immobilization drugs used by WS-Kansas under this Act.

1.7.2.6 National Historic Preservation Act (NHPA). NHPA of 1966, as amended, and its implementing regulations (36 CFR 800) requires federal agencies to: 1) determine whether activities they propose constitute "undertakings" that can result in changes in the character or use of historic properties and, 2) if so, to evaluate the effects of such undertakings on such historic resources and consult with the State Historic Preservation Office regarding the value and management of specific cultural, archaeological and historic resources, and 3) consult with appropriate American Indian Tribes to determine whether they have concerns for traditional cultural properties in areas of these federal undertakings. Tribes' request WS-Kansas BDM and sign agreements for WS-Kansas to conduct BDM on their lands; thus, tribes have control over any potential conflict with cultural resources on tribal properties. WS-Kansas activities as described under the proposed action do not cause ground disturbances nor do they otherwise have the potential to significantly affect visual, audible, or atmospheric elements of historic properties and are thus not undertakings as defined by NHPA. BDM could benefit historic properties if birds were damaging such properties. In those cases, the officials responsible for management of such properties would make the request and would have decision-making authority over the methods to be used. Harassment techniques that involve noise-making could conceivably disturb users of historic properties if they were used at or in close proximity to such properties; however, it would be an exceedingly rare event for noise-producing devices to be used in close proximity to such a property unless the resource being protected from bird damage was the property itself, in which case the primary effect would be beneficial. Also, the use of such devices is generally short term and could be discontinued if any conflicts with historic properties arose. WS has determined BDM actions are not undertakings as defined by the NHPA because such actions do not have the potential to result in changes in the character or use of historic properties. A copy of this EA is being provided to each American Indian Tribe in Kansas to allow them opportunity to express any concerns that might need to be addressed prior to a decision.

1.7.2.7 Bald and Golden Eagle Protection Act. The Bald and Golden Eagle Protection Act of 1940 (16 USC, 668-668d), as amended, allows for the protection and preservation of Bald Eagles and Golden Eagles by prohibiting, except under certain specified conditions, the taking, possession and commerce of these birds. The Secretary of the Interior can permit the taking, possession and transportation of specimens for scientific or exhibition purposes or for the religious purposes of Native American Tribes if the action is determined to be compatible with the preservation of the Bald or Golden Eagle.

BDM could benefit eagles by providing protection from a direct wildlife threat to birds, nests or eggs by predation or disease, protection to individuals from being killed by aircraft strikes, or prevent eagles from being killed illegally by frustrated or careless individuals experiencing eagle damage or damage threats to resources. Although presumed to be limited in Kansas, depredation to livestock and wildlife by eagles has been documented in other states. Generally, depredation to livestock is associated with Golden Eagles. Any interaction with eagles by WS is further tempered by WS Policy (WS Directive 2.315).

1.7.2.8 Executive Order 13186 - Responsibilities of Federal Agencies to Protect Migratory Birds. Executive Order 13186 of January 10, 2001 directs federal agencies taking actions that have, or are likely to have, a measurable negative effect on migratory bird populations to develop and implement, within 2

years, an MOU with USFWS that shall promote the conservation of migratory birds. WS currently has been working with USFWS on the MOU to cover such activities.

1.7.2.9 Executive Order 13112 - Invasive Species. Nonnative plants and animals that inadvertently find their way to the United States are of increasing concern as they threaten our natural resources. One study estimates that the total costs of invasive species in the United States amount to more than \$100 billion each year (Pimentel et. al., 1999). Invasive species impact nearly half of the species currently listed as T&E under the ESA. On February 3, 1999, Executive Order 13112 was signed establishing the National Invasive Species Council. The Council is an inter-Departmental body that helps to coordinate and ensure complementary, cost-effective Federal activities regarding invasive species. Council members include the Departments of the Interior, Agriculture, Commerce, State, Treasury, Transportation, Defense, and Health and Human Services, and EPA, and the U.S. Agency for International Development. Together with the Invasive Species Advisory Committee, stakeholders, concerned members of the public, and member departments, the National Invasive Species Council formulated an action plan for the nation. The Council issued the National Invasive Species Management Plan early in 2001 to provide an overall blueprint for Federal action. The Plan recommends specific action items to improve coordination, prevention, control and management of invasive species by the Federal agency members of the National Invasive Species Council.

1.7.2.10 Executive Order 12898 - Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations. Environmental Justice is a movement promoting the fair treatment of people of all races, income levels and cultures with respect to the development, implementation and enforcement of environmental laws, regulations and policies. Environmental justice, also known as Environmental Equity, has been defined as the pursuit of equal justice and equal protection under the law for all environmental statutes and regulations without discrimination based on race, ethnicity, or socioeconomic status. This Executive Order is a priority within both APHIS and WS. Executive Order 12898 requires Federal agencies to make environmental justice part of their mission, and to identify and address disproportionately high and adverse human health and environmental effects of Federal programs, policies and activities on minority and low-income persons or populations. APHIS plans to implement Executive Order 12898 principally through its compliance with the provisions of NEPA. All WS activities are evaluated for their impact on the human environment and compliance with Executive Order 12898 to insure environmental justice. WS personnel use WDM methods as selectively and environmentally conscientiously as possible. It is not anticipated that the proposed action would result in any adverse or disproportionate environmental impacts to minority and low-income persons or populations.

CHAPTER 2: DISCUSSION OF ISSUES

Chapter 2 contains a discussion of the issues, including issues that will receive detailed environmental impacts analysis in Chapter 4 (Environmental Consequences), issues that have driven the development of policies, and issues that will not be considered in detail, with rationale. Pertinent portions of the affected environment will be discussed with the issues used to develop operating policies in this chapter. Additional information on the affected environments will be incorporated into the discussion of the environmental impacts in Chapter 4.

A major overarching factor in determining which issues to include for analysis of the potential environmental impacts of WS-Kansas's involvement in BDM in Kansas is that if, for whatever reason, the BDM conducted by WS-Kansas were discontinued, similar types and levels of BDM will most likely be continued by State or local governments or private entities as allowed by State and Federal laws. Thus, many of the BDM activities could take place without Federal assistance, and, hence, would not trigger NEPA. From a practical perspective, this means that the Federal WS program has limited ability to affect the environmental outcome of BDM in Kansas, except that, based on WS-Kansas employees' years of professional expertise and experience in dealing with BDM actions, WS-Kansas is likely to have lower risks to and effects on nontarget species and the human environment in general, including people, than some other programs or alternatives available to State agencies and private landowners. Therefore, WS-Kansas has a less likely chance of negatively affecting the human environment affected by BDM actions than would non-Federal or private entities. In other words, WS-Kansas BDM activities most likely have less of an adverse effect on the human environment than would BDM programs that would be likely to occur in the absence of WS-Kansas BDM assistance. Thus, WS-Kansas has a limited ability to affect the environmental status quo in Kansas. Despite this limitation of Federal decision-making in this situation, this EA process is valuable for informing the public and decision-makers of relevant environmental issues and analyzes these under the potential alternatives of BDM to address the various needs for action described in the EA.

2.1 ISSUES

The following issues or concerns about BDM have been identified through interagency planning and coordination, from the EA which preceded this document (WS 2008).

- Effects of BDM on Target Bird Species Populations
- Effects of BDM on Nontarget Species Populations, including T&E Species
- Effects of BDM on Public and Pet Safety and the Environment
- Effects of BDM on Aesthetics

2.1.1 Effects of BDM on Target Bird Species Populations

A common concern among members of the public, wildlife management agencies, and WS is whether BDM actions adversely affect the viability of target native species populations. The target species selected for analysis in this EA are the primary ones which may be affected by WS-Kansas's BDM activities, especially those species that more than just a few individuals would likely be killed by WS' use of lethal control measures under the proposed action in any one year. Those species include three nonindigenous species, the European Starling, feral domestic pigeon, and House Sparrow, and various blackbird species (Red-winged Blackbirds (*Agelaius phoeniceus*), Brown-headed Cowbirds (*Molothrus ater*), and Common Grackles (*Quiscalus quiscula*)). Other species that have been killed in limited numbers include Great Blue Herons (*Ardea herodias*), Little Blue Herons (*Egretta caerulea*), Green Herons (*Butorides striatus*), Great Egrets (*Casmerodius albus*), Snowy Egrets (*Egretta thula*), Cattle

egrets (*Bubulcus ibis*), Turkey Vultures (*Cathartes aura*), hawks (*Accipiter spp.* and *Buteos spp.*), American crows, shorebirds, waterfowl, and swallows. Also, there may be concerns about potential adverse impacts from WS' harassment of nesting egrets in urban areas during spring. This analysis will address those impacts as well.

Maintaining viable populations of all native species is a concern of the public and of biologists within the state and federal land and wildlife management agencies, including WS. This EA will analyze the potential impacts on the primary species targeted in BDM by WS-Kansas which, for purposes of this EA are primarily European Starlings, House Sparrows, feral domestic pigeons, blackbirds (primarily Red-winged Blackbirds and Brown-headed Cowbirds), Canada Geese, Mallards, and Cattle Egrets. Scoping revealed that some persons believe WDM interrupts the "balance of nature" and this should be avoided. Others believe that the "balance" has shifted to unfairly favor generalist species, including birds. Several species' populations have steadily increased over the past several years due to adaptability to human-made environments, and damage from these species has increased accordingly (International Association of Fish and Wildlife Agencies 2004). To address these concerns, the effects of the alternatives on populations for each target species are examined. To fully understand the need for BDM, it is important to have knowledge about the species that cause damage and the likelihood of damage. Full accounts of life histories for these species can be found in bird reference books. Some background information is given here for the bird species in Kansas covered by this EA, especially information pertaining to their range and seasonal movements in Kansas. The species are basically given in order of WS-Kansas BDM efforts directed towards them, their subsequent take, and the occurrence and value of damage that the species cause in Kansas. Some of the lesser damaging species are lumped with others where life history and damage are somewhat similar. Finally, it should be noted that jurisdiction and management of these species mostly lies with USFWS and KDWP which was discussed in Section 1.7.1.2 and 1.7.1.5. Additionally, some of the birds addressed in this EA are harvested in Kansas by hunters. Where data is available, harvest is used with WS-Kansas take to determine cumulative impacts.

2.1.1.1 Basic Bird Species Information.

Starlings and Blackbirds. European Starlings and blackbirds are common residents and migrants in Kansas. Seven species of blackbirds are found in Kansas; Red-winged, Yellow-headed (*Xanthocephalus xanthocephalus*), Brewer's (*Euphagus cyanocephalus*), and Rusty Blackbirds (*Euphagus carolinus*), Common and Great-tailed Grackles, and Brown-headed Cowbirds and all are abundant seasonally, except the Rusty Blackbird. Blackbirds are medium sized songbirds with heavy bills. They have iridescent black feathers and medium length tails. Starlings are similar in size, but appear stockier with a shorter tail and are heavily speckled in winter; they were introduced into North America from Europe. Starlings are cavity nesters and will use any structures with holes for nesting. All are gregarious, especially in winter when they form roosts in the thousands of mixed species. Large flocks begin to form roosts as early as August and disband in April. Starlings require a higher protein diet consisting of mainly fruits, insects, and some grains. Blackbirds are primarily granivorous. Blackbirds are attracted to a variety of habitats depending on the species. Brewer's Blackbirds and starlings are attracted to urban areas such as the airport, grass and weedy fields, and fallow croplands and livestock feeding operations. Brown-headed Cowbirds are found in similar environments and open woodlands. These species form roosts in winter where cover and warmth is provided. Red-winged and Yellow-headed Blackbirds and Common Grackles are attracted to croplands and weedy fields, and roost and nest in marshy areas, especially cattails. Rusty Blackbirds are common in wet woodlands. The species roosts with other blackbird species, but often is found foraging in single species flocks or together with common grackles in or near wooded wetlands. Only occasionally are rusty blackbirds observed foraging in agricultural fields with other blackbirds. The majority of blackbirds leave Kansas during winter, but the European Starling can be found in Kansas year round. The Yellow-headed Blackbird only breeds in Kansas,

typically migrating south for the winter. The Rusty and Brewer's Blackbirds nest further north but migrate through Kansas with some wintering. The European Starling, Red-winged Blackbird, Common Grackle, and Brown-headed Cowbird are the most abundant species in Kansas, far surpassing the other species. Blackbirds are classified as migratory nongame birds, but can be taken under a USFWS Depredation Order when concentrated in a manner that constitutes a health hazard. The starling is unprotected by State and Federal laws and can be taken at any time. Blackbirds and starlings can cause significant damage to agricultural crops and livestock operations. Blackbirds and starlings are considered a great threat to aviation because of the large flocks they form. In addition, winter roosts are a noise nuisance and their droppings damage buildings and property; if droppings are allowed to build up, they can become a source of several infectious diseases. Nesting by starlings can create a number of problems, including nuisance and fire hazards to buildings. Brewer's Blackbirds, in particular, are very aggressive nesters and will often attack people nearing the nest. Finally, the Brown-headed Cowbird is a parasitic nester, lay eggs in other bird nests. This has been linked to add to the decline of several song birds such as the Black-capped Vireo, a historic nester in Kansas.

Pigeons and Doves. Feral pigeons (Rock Pigeons), Mourning Doves (*Zenaida macroura*), and Eurasian Collared-Doves (*Streptopelia decaocto*) are found in Kansas. Feral pigeons and Mourning Doves are abundant. Eurasian Collared-Doves, an invasive species, are uncommon, but increasing after being introduced in southeastern United States. Feral pigeons are mid-sized familiar urban birds. Doves are smaller, but also familiar. All have robust bodies with small heads and short beaks. All are powerful fliers; Mourning Doves typically fly close to the ground near cover between feeding and roosting areas, while feral pigeons will fly at higher altitudes. Feral pigeons are found, urban and agricultural areas in close association with man; buildings often provide desirable nesting areas (i.e. flat surfaces under eaves). Mourning Doves and Eurasian Collared-Doves are common near wooded streams, in agricultural and weedy fields, and in urban areas. Feral pigeons cause a wide variety of damage and are a threat to aviation due to size and flocking behavior, abundance, and medium size. Feral pigeons also have an impact on property from their droppings; their droppings will deface buildings and paint on airplanes in hangars. Pigeons and their droppings, if allowed to build up, are a source of several diseases such as psittacosis that can infect people. Feral pigeons are not regulated by federal or state laws and can be taken at any time. Mourning Doves are migratory game birds. Eurasian Collared-Doves are an invasive species, but regulated as a migratory game bird.

House Sparrows. The House Sparrow (sometimes referred to as English sparrow) is common in urban and agricultural areas. They were introduced into the United States from Europe and have become established from coast to coast. They are very common in Kansas. House Sparrows are small chunky birds with thick bills. Males have a gray crown, chestnut nape, black bib, and black bill. Females are brown overall with streaked backs, buffy eye-stripes, and unstreaked breasts. House Sparrows are found in close association to people, especially on farms, where cavities for nesting, dense trees for roosting, and food sources are available. House Sparrows are primarily granivorous; seeds, grains, and fruits make up almost their entire diet, but they will also feed on refuse from trash bins and in parking lots. Damage includes consumption and contamination of stored grains and damage to structures and other property from pecking. Their bulky nests in the cavities of buildings and other structures create a fire hazard and require constant cleaning maintenance. Their winter roosts, often in the thousands, are a noise nuisance and their droppings are a source of several diseases and parasites that increase custodial maintenance costs. House Sparrows are not usually considered a great airstrike hazard. House Sparrows are classified as nonmigratory, nongame birds and can be taken at any time without a permit.

Raptors. Raptors include vultures, eagles, hawks (osprey, kites, harriers, accipiters, buteos, and falcons), and owls. Shrikes are also included in this category because of behavioral similarities. Kansas has one species of vulture, 2 eagles, 14 hawks, 6 owls, and 2 shrikes that have the potential to be involved in BDM projects. Raptors are predatory birds and scavengers that possess hooked beaks and talons to

capture and feed on prey. Shrikes do not have talons, instead they impale their prey on thorns or barbed-wire to feed on them. Raptors range in size from small such as the Burrowing Owl (*Athene cunicularia*) and American Kestrel (*Falco sparverius*) to large such as Golden Eagles (*Aquila chrysaetos*). Most species have typical hunting styles; soaring (vultures, eagles, red-tailed hawks), low-flying (harriers) and dense forest (accipiters) ambush, hovering (kestrel), and watching from perches (buteos, owls). Most are solitary hunters. Most owls are nocturnal and hunt at night. The combination of abundant small mammal populations, open spaces, and roosting and perching structures provides ideal habitat for most raptors. Most raptors do not cause significant problems. Eagles, Red-tailed Hawks (*Buteo jamaicensis*), Great Horned Owls (*Bubo virginianus*), and, to a lesser extent, other raptors will take livestock and poultry. Turkey Vultures will roost sometimes in large flocks and can be an odor nuisance in and around residences or cause property damage to structures. Cooper's Hawks (*Accipiter cooperii*) sometimes chase prey bird species into warehouses where they must be trapped to be released back outside. Mississippi Kites (*Ictinia mississippiensis*) are very aggressive nest defenders and will occasionally strike people that near their nest, often drawing blood from the victim of their attack. However, this problem infrequently occurs in Kansas. Raptors, though, represent a significant hazard to aircraft due to their larger sizes and hunting over open spaces such as airfields. Raptors are protected as migratory birds. Eagles are specifically protected under their own Act and an additional permit is required to harass or take them. Wildlife control personnel avoid harassing eagles, but would if it became necessary at an airport where they were a potential threat to aircraft. The Bald Eagle (*Haliaeetus leucocephalus*), Northern Harrier (*Circus cyaneus*), Ferruginous Hawk (*Buteo regalis*), Peregrine Falcon (*Falco peregrinus*), Common Barn Owl (*Tyto alba*), Burrowing Owl, Short-eared Owl (*Asio flammeus*), and Loggerhead Shrike (*Lanius ludovicianus*) are species of special concern (USFWS 2008) and considered accordingly.

Waterfowl. Waterfowl primarily refers to ducks, geese, and swans, but also cranes, moorhens, and coots because these species have mostly been managed as migratory game birds and are similar in size and behavior. Ducks can be further subdivided into surface feeders and divers. Ten species of surface feeding ducks, 11 species of diving ducks, 5 geese, a swan, 2 cranes, a moorhen, and a coot can be found in Kansas. Most are common seasonally, some only migrating through Kansas. Of all of the species, Canada Geese and Mallards are abundant year round and cause the most damage concerns. Waterfowl are aquatic birds with webbed feet, long necks, narrow pointed wings, and short legs. Cranes are tall birds with long legs, beak, and neck, and non-webbed feet. Coots (*Fulica americana*) are black with short tails and stubby, rounded wings; they have lobed toes and a short, whitish beak with a black band near the tip. Waterfowl, cranes, and coots are attracted to wetlands. Several species of ducks, geese, cranes, and coots are attracted to field crops such as wheat; geese, swans, and to a lesser extent, wigeons and coots, frequent grass and winter wheat fields. Other species, especially the divers, are attracted to open water where they feed on fish and submerged aquatic vegetation and some can be a problem at aquaculture facilities. Canada Geese and Mallards are often a nuisance in urban areas at parks where they cause property damage and fecal contamination of water and lawns. Additionally, nesting Canada Geese can be very aggressive and injure people nearing their nests. Waterfowl are particularly hazardous to aircraft because of their size and weight, flocking behavior, and relative abundance. Waterfowl, cranes, and coots are protected as migratory game birds by federal and state laws, but most can be hunted during the fall and winter. Hunting dramatically increases the effectiveness of hazing techniques. Permits are needed to take them at other times of the year, or where hunting is not allowed. The Whooping Crane (*Grus Americana*) is a federally listed endangered species and is avoided. Control of this species, including hazing activities, would require additional permits (this species would only be a problem if it temporarily stopped in an air operating area of an airport where hazing would not only protect aircraft, but the endangered crane too).

Wading Birds. Waders include herons, egrets, ibis and bitterns or 12 species in Kansas. The largest, the Great Blue Heron, is very common along with the Cattle Egret and Black-crowned Night-Heron (*Nycticorax nycticorax*). The others are present, but not as common. Most wading birds are medium-

sized and have long legs, beaks, and necks for stalking and hunting foods in shallow waters and open fields. Many are adorned with plumes in the breeding season. Wetlands and open areas with abundant prey such as rodents, amphibians, insects, and crayfish are attractive to most wading birds. Many of the species communally nest and these can become an odor and noise nuisance in residential areas. Additionally, where these nesting areas are used year after year, the trees often die from fecal contamination. Wading birds can be a significant problem to aircraft because of their size and slower flight speeds; the feeding behavior of great blue herons and great egrets in open grasslands and the flocking behavior of particularly the cattle egret present additional hazards to aircraft. Wading birds are protected as migratory non-game birds. The White-faced Ibis (*Plegadis chihi*) and American Bittern (*Botaurus lentiginosus*) are species of special concern in Kansas (USFWS 2008).

Shorebirds. Kansas hosts 37 species of shorebirds including avocets, stilts, plovers, sandpipers and phalaropes. Most only migrate through Kansas, but the Killdeer (*Charadrius vociferous*) and Upland Sandpiper (*Bartramia longicauda*) are abundant during the nesting season. Avocets and stilts are sleek and graceful waders with long slender beaks, and spindly legs. Plovers are compact birds with short beaks; they dart across mudflats, will stop abruptly, and race off again. Sandpipers vary much more, but typically have medium to long legs and beaks, and flocks fly seemingly erratic, but in unison. Phalaropes are similar to plovers with semi-webbed feet and they spin like tops in the water when they are feeding; phalaropes are somewhat unique in that the female is the more colorful and larger. Most shorebirds are attracted to open, shallow water and mudflats. A few can be seen around agricultural fields, especially fallow or short grass fields, after rains. They feed on invertebrates, typically probing mudflats with their beaks. Shorebirds are commonly hit by aircraft where they are abundant. A few shorebirds are medium in size and most flock presenting their biggest threat to aviation. Aviation safety is again the primary concern with these species. Shorebirds are protected as migratory non-game birds. The Eskimo Curlew (*Numenius borealis*) is listed as endangered, but is likely extinct. The Piping Plover (*Charadrius melodus*), listed as threatened, migrates through Kansas. Additionally, USFWS (2008) lists three other species as species of management concern, the Mountain Plover (*Charadrius montanus*), Upland Sandpiper, and Long-billed Curlew (*Numenius americanus*).

Other Fish-eating Birds. Five species of terns, the American White Pelican (*Pelecanus erythrorhynchos*), Double-crested Cormorant (*Phalacrocorax auritus*), and Belted Kingfisher (*Ceryle alcyon*) are found in Kansas, but most only migrate through the State with breeding in isolated areas. The majority winter further south. Terns are typically similar to gulls, except that they are smaller and slimmer with long narrow wings, forked tails, and pointed beaks. Pelicans are large, white water birds with a massive bill and throat pouch, and black wing tips. Cormorants are large, black birds with set back legs, a hooked bill, and reddish-orange facial skin and throat pouch. All form small flocks. Kingfishers are smaller stocky birds with a slate blue back and breast band. Terns, pelicans, and kingfishers dive from the air and cormorants from the water's surface to catch fish. Pelicans and terns primarily roost and nest on the ground, cormorants in trees submerged in water, and kingfishers in banks. These species are attracted to open waters with a good fishery. Kingfishers are usually associated with wooded streams and lakes where they hunt fish and aquatic invertebrates from trees, wires, or other perches. All of these species can cause damage at aquaculture facilities and to native fish stocks. Pelicans and cormorants both represent significant hazards to aircraft because of their size and flocking behavior. They also fly at higher altitudes while traveling to and from feeding areas. Terns are only a problem at airports where good fishing waters are present. Kingfishers are usually not much of a problem because of habitat preference. These species are migratory non-game birds. The Least Tern's (*Sterna antillarum*) interior population is listed as endangered. The Black Tern (*Chlidonias niger*) is a species of management concern (USFWS 2011).

Corvids. Corvids are jays, magpies, crows, and ravens, and are represented by 6 species in Kansas, but only the Blue Jay (*Cyanocitta cristata*), Black-billed Magpie (*Pica pica*), and American Crow are

somewhat abundant. Corvids are well-known, boisterous birds. Crows and ravens are medium sized black birds that are slightly iridescent in sunlight. Magpies are black and white birds that appear medium-sized because of their relatively long tail. Jays have blue in varying amounts contrasted with gray, black and white. Crows, magpies and blue jays are common in open areas close to dense or scattered trees, brushy or riparian habitats. Corvids are opportunistic feeders and will feed on a wide variety of food including fruits, nuts, small animals, insects, refuse, and carrion. Activities such as plowing are very attractive to magpies and crows because of the food that becomes exposed. Crows and magpies are flocking during the winter and can cause problems. The winter roosts of magpies and crows can be a noise nuisance and potential health hazard from accumulated fecal material. All of these species, but especially flocking birds, can cause damage to crops such as pecans and corn. Ravens and magpies will kill livestock, primarily those that are somewhat incapacitated such as newborns or cows calving. Crows and ravens are medium size and can inflict severe damage to airplanes, especially where they are hunting insects in the airfield. Crows are commonly struck by aircraft. Corvids are migratory birds; the crow is a game bird and the others are nongame. Crows and magpies can be taken without a permit when found doing damage.

Woodpeckers. Eight species of woodpeckers are found in Kansas and all are fairly common. Woodpeckers are familiar birds because of their drumming and cavity building behavior. They are relatively small birds with short legs, two forward - two back, sharp clawed toes for climbing trees, stiff tail feathers for support, and a sharp, stout beak for drilling. These characteristics enable them to climb trees while probing for insects or making cavities. Woodpeckers are found near or in wooded areas. Their flight is undulating, a very characteristic trait. They are territorial and usually found alone or in pairs. Woodpeckers are primarily attracted to areas with trees, space, water, and a good food supply. Woodpeckers are primarily insectivorous, though they also eat fruits and nuts (sap for sapsuckers). Woodpeckers can damage structures such as buildings and telephone poles. They can also damage crops such as pecans. Since woodpeckers are fairly territorial, damage is typically at low levels and uniform throughout orchards rather than focused in a particular area. Woodpeckers are protected as migratory non-game birds. The Red-headed Woodpecker is a species of management concern (USFWS 2011).

Nighthawks, Swifts, and Swallows. Five species of swallows, the Purple Martin (*Progne subis*), Chimney Swift (*Chaetura pelagica*), and Common Nighthawk (*Chordeiles minor*) are found in Kansas. Two nightjars, the Whip-poor-will (*Caprimulgus vociferous*) and Chuck-will's-widow (*Caprimulgus carolinensis*) are also found in Kansas, but are typically not associated with damage because of habitat preference (typically forested). Swallows and swifts are slender aerialists with long-pointed wings. Nighthawks are similar, but much larger and primarily nocturnal. Swifts are especially fast fliers. They all feed on insects caught on the wing with their wide, gaping mouths. Cliff (*Hirundo fulva*) and barn swallows (*Hirundo rustica*) build mud nests under eaves and bridges. The other swallows, and swifts, nest in cavities of rocks, banks, and trees. Nighthawks nest on the ground or large branches. These species are attracted to areas with an abundance of flying insects. They also are attracted to areas with suitable roosting or nesting habitat (barren to sparsely vegetated ground with large trees for nighthawks, dead snags in riparian areas for tree swallows, eaves or tunnels for mud-nest builders, crevices and cracks in buildings or rocks for the others). The primary damage from this group is from the mud-nest builders, and especially the colonial nesting Cliff Swallow (Barn Swallows are usually tolerated because they are single nesters). Mud-nest builders can cause damage from falling debris and droppings, especially in and around buildings, causing continual clean-up costs during the nesting season. Additionally, parasites (bugs such as mites and fleas) in the nest can cause problem for domestic animals and people. Chimney swifts can also cause damage from their twig nests in chimneys and other structures. All of these species can be a problem at airports where colonies of them are found because they are commonly on the wing, like bats, searching for insects; nighthawks can cause more damage to aircraft than the other species because they are larger in size. Swallows, swifts, and nighthawks are migratory nongame birds.

Gulls. Gulls are familiar birds. Only 4 species are consistently found in Kansas in any numbers, the Ring-billed (*Larus delawarensis*), Herring (*Larus argentatus*), Bonaparte's (*Larus philadelphia*), and Franklin's Gulls (*Larus pipixcan*). The majority of gulls in Kansas are seen during migration or winter months. Gulls are robust birds with webbed feet, long pointed wings, a stout slightly-hooked bill, and, typically, a square tail. Most gulls are white with gray backs and black wing tips and, sometimes, heads. Gulls are attracted to water or food including refuse from dumpsters and landfills, earthworms, insects, and carrion. They are also attracted to lakes, sandy beaches, flat-roofed buildings, parking lots, and airports because they often provide ideal loafing sites. Gulls are considered a primary hazard at airports because of their size, abundance, wide and expanding distribution, flocking behavior, and general tendency to concentrate at airports. Several have been struck at airports in Kansas. Gulls are also a problem at landfills where they may carry off refuse, potentially hazardous materials, to nearby areas (landfills are often cited by the Health Department for not having adequate bird control programs). Finally, gull fecal material, such as on a rooftop, can build-up to the point of causing damage. Gulls occasionally will also damage agricultural crops. Gulls are protected as migratory birds under the Migratory Bird Treaty Act by USFWS, and are classified as migratory nongame birds by KDWP.

Gallinaceous Birds. The Ring-necked Pheasant (*Phasianus colchicus*), Greater (*Tympanuchus cupido*) and Lesser Prairie-Chickens (*Tympanuchus pallidicinctus*), Wild Turkey (*Meleagris gallopavo*), and Northern Bobwhite (*Colinus virginianus*) are found in Kansas and are collectively known as gallinaceous birds. Gallinaceous birds are basically ground-dwellers with short, rounded wings and short strong bills. Flight is usually very brief for these species as they prefer to walk. Males are typically very colorful and perform elaborate courting displays. Pheasants and quail can be found in several habitats ranging from riparian woodlands to agricultural fields, but primarily open areas with brushy cover. Quail are normally found close to permanent water. Turkeys are found in close association with wooded regions. The prairie-chickens are found in short- and long-grass prairies with interspersed agricultural areas. All are primarily grain and seed eaters. Of these, the turkey and pheasant are usually the only two that cause problems, primarily to agricultural crops. However, their damage is often tolerated because they are highly sought after game birds. Additionally, these species can be hazardous to aircraft when found on or around airports. Gallinaceous birds are protected as resident game birds by KDWP (no hunting season for the Lesser Prairie-Chicken) and have hunting seasons. These birds are non-migratory and not protected by federal laws.

Loons and Grebes. Kansas commonly has a species of loon (*Gavia immer*) and 5 grebes that mostly migrate through Kansas with few breeding or wintering. None of them is particularly common. Loons are large waterbirds with thick bills and necks, and webbed feet; they submerge directly underwater to feed on fish, crustaceans, and aquatic plants. Grebes are smaller with narrow beaks, long thin necks, and lobed toes; they dive forward to submerge under water and feed on fish. Loons and grebes are rarely seen in flight. Loons and grebes live in close association to wetlands with abundant fish, invertebrates, and aquatic vegetation. These species typically only cause minor damage at aquaculture facilities because they are non-flocking. None of these species represent significant hazard to aircraft because they are fairly solitary and stay close to water. Loons and a few grebes can be hazardous, though, because of their large size and slow flight. They frequently fly at night creating more concern. Loons have been struck by aircraft, though infrequently, and could potentially cause severe damage. These species are classified as migratory non-game birds.

Frugivorous Birds. Several of the fruit and seed eating birds are found in Kansas and can cause damage. The most notable of these in Kansas, other than those discussed above, are the American Robin (*Turdus migratorius*), Cedar Waxwing (*Bombycilla cedrorum*), and House Finch (*Carpodacus mexicanus*). These birds are all mid-sized small birds, often forming large flocks. The robin is well-known with its red-breast and slate black back. Waxwings are brownish and have crests, black masks, short tails with yellow tips; they get their name from wax-like red tips on the wing feathers of adults. House Finches are small

brownish sparrow-sized birds; males have a bright red forehead, breast, and rump. These species are attracted to trees that have fruits or nuts, grains, and areas with an abundance of insects. Earthworms are a major attractant for robins. Most prefer brushy to open areas with scattered trees, and also dense forests. Robins use dense trees or thickets for roosting. Grapes and other fruits can be significantly damaged by these species. Other than agricultural damage, robins and finches can form nightly roosts in residential areas causing some nuisance problems. Additionally, House Finches build large bulky nests, similar to House Sparrows, often in structures that can be a fire hazard. These species are migratory nongame birds and can be taken with a federal permit.

Grassland Species. Eastern (*Tyrannus tyrannus*) and Western (*Tyrannus verticalis*) Kingbirds, Western (*Sturnella neglecta*) and eastern (*Sturnella magna*) meadowlarks, Horned Larks (*Eremophila alpestris*), pipits, Dickcissels (*Spiza americana*), Bobolinks (*Dolichonyx oryzivorus*), longspurs, buntings, and goldfinches are often found in grasslands or semi-open country and are common grassland species in Kansas. Kingbirds, phoebes, and flycatchers are somewhat small birds that are often found in somewhat open country using hunting perches for hawking insects. Horned Larks, pipits, longspurs, and Snow Buntings (*Plectrophenax nivalis*) are slender, sparrow sized ground dwellers. Western and Eastern Meadowlarks are similar in size and appearance to starlings except they are light brown with black Vs on their breasts and yellow underparts. Dickcissels are somewhat smaller versions of meadowlarks. These species, with the exception of the kingbirds, phoebes, and flycatchers, form mostly loose-knit flocks, especially in winter. These species are attracted to short grass habitats and agricultural fields where seeds and insects are abundant. These species tend to stay near the ground; however, meadowlarks and kingbirds will use perches such as telephone wires. These species are often abundant at airports where they are struck by aircraft. Though most are rather small in size, these species often will be in flocks of up to several hundred (horned larks, buntings, and longspurs often congregating together) presenting a hazardous situation. Additionally, the Horned Lark is often referred to as a “feathered-bullet” because of its dense body mass relative to other species and cause significantly more damage than similar sized birds. These species may need to be controlled periodically at airports. All of these species are migratory nongame birds.

Other Birds. A few other birds in Kansas cause damage, though only infrequently. The Northern Mockingbird (*Mimus polyglottos*) is a very aggressive nester, often attacking people that come near the nest. This is especially a problem at the entrance to residences and businesses. Northern Cardinals (*Cardinalis cardinalis*) often see their reflection in windows and incessantly attack the window, becoming a nuisance or sometimes damaging screens. Finally, Greater Roadrunners (*Geococcyx californianus*) are fairly common in the southern counties of Kansas. The Greater Roadrunner will take eggs, nestlings, and other wildlife and could be implicated in very local problems. Several other birds are commonly found in Kansas (Table 2 in Appendix B), but few cause, or are expected to cause, damage.

2.1.1.2 Bird Population Estimates. To determine impacts from WS-Kansas BDM lethal activities, a reasonable estimate of bird populations is needed. The estimate is best if it is specific to the population affected, and the area where and when birds are present that cause damage. However, most estimates can only encompass the overall population of birds that are likely to cause damage because data is unavailable for specific populations and impacts to the overall population within a large geographic area are most meaningful. Most bird populations are either migratory or resident, but some birds species have populations that are truly both (e.g., Canada Geese). The majority of WS-Kansas BDM projects involving migratory birds come from the Central Flyway, but some can come from the other flyways in North America (Figure 4). Several migratory species are found in Kansas year round, but the population may actually shift during the year (e.g., European Starling). Additional birds may come into Kansas for the winter while some that summer in Kansas may leave. Some species only nest in Kansas and migrate out of the State from fall through spring (e.g., Upland Sandpiper). Some only migrate through the State from northern breeding areas to southern wintering grounds (e.g., Rusty Blackbird) and return passing

through in spring. And finally, some species of migratory birds targeted in BDM may only winter in Kansas (e.g. Herring Gull). For the most part, starlings, feral pigeons and House Sparrows have resident populations with some starlings and House Sparrows migrating into the State in winter from northern states. Canada Geese have a “resident” population and have migrants that pass through or winter in the State, but most all lethal BDM for Canada Geese invariably involves the “resident” geese as WS-Kansas damage management activities for them occur from spring through summer with nesting geese.

Current bird population estimates are unavailable for most species of birds and thus have to be estimated from the best available information. The best information currently available for monitoring most bird population trends is data from the Breeding Bird Survey (BBS). The BBS is a long-term (1966-2015), large-scale inventory of North American birds, coordinated by the U.S. Geological Survey, Patuxent Wildlife Research Center, combines a set of over 3,500 roadside survey routes primarily covering the continental United States and southern Canada (Sauer et al. 2017). BBS routes are surveyed each May and June by experienced birders. The stated primary objective of the BBS has been to generate an estimate of population change for songbirds. Estimates of population trends from BBS data are derived primarily from route-regression analysis (Geissler and Sauer 1990) and are dependent upon a variety of assumptions (Link and Sauer 1998). The statistical significance of a trend for a given species is reflected in the calculated P-value (i.e., the probability of obtaining the observed data or more extreme data given that a hypothesis of no change is true) for a particular geographic area and is best calculated over a number of years. BBS trends are available for 1966 to 2015 and 2005 to 2015, or can be analyzed for any set of years desired. BBS data can be summarized for Kansas, the Central Flyway (the northern limit of the BBS is in central Alberta and Saskatchewan), or survey-wide for species breeding in the BBS survey area.

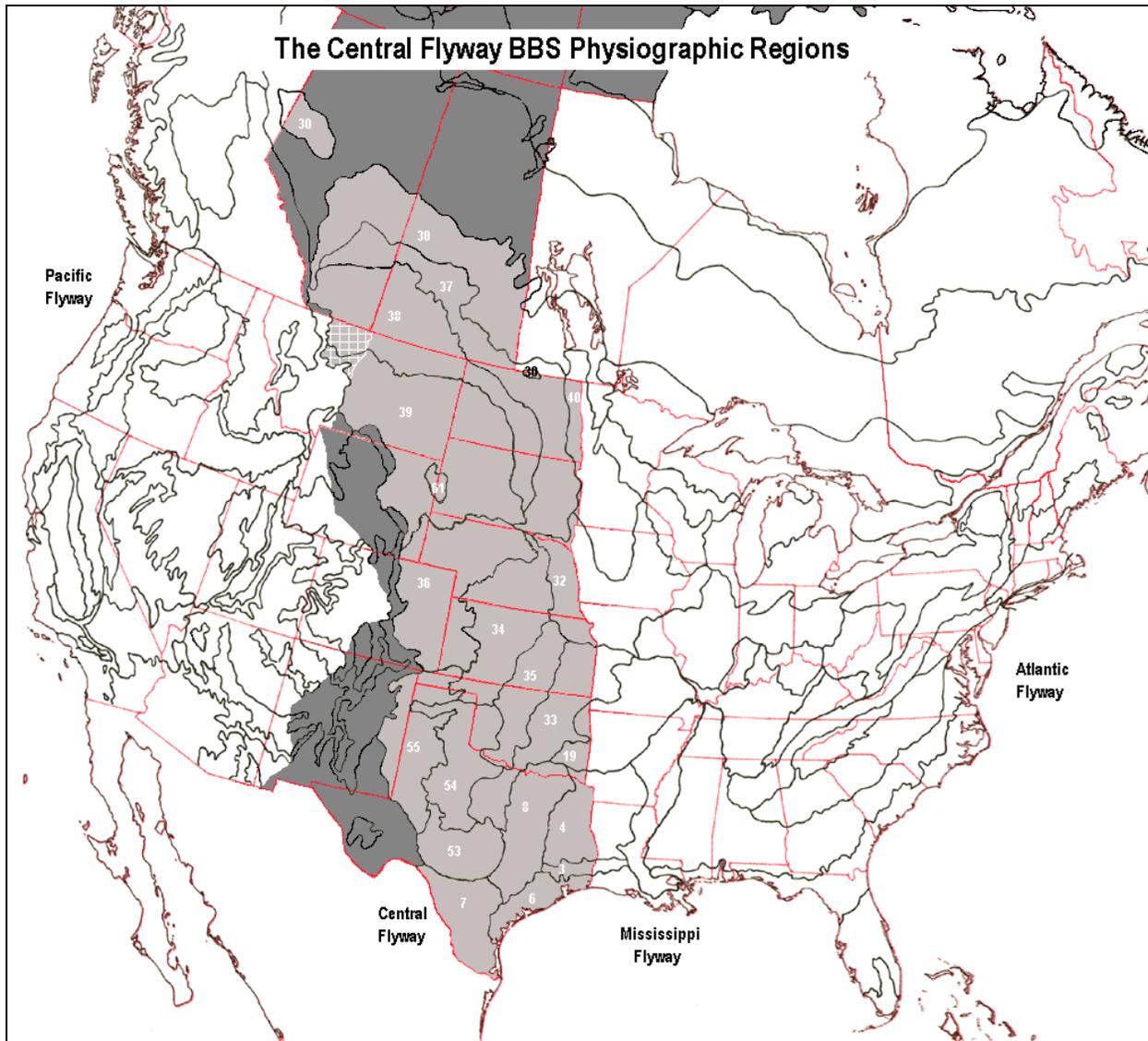


Figure 4. BBS physiographic regions with the Central Flyway (shaded) BBS physiographic regions (shaded light gray) used to estimate migratory bird populations for this EA, including those portions of 38 and 39 in Montana (thatched white) in the Pacific Flyway, but excluding deserts, mountainous, and boreal forest areas of Central Flyway and areas north of the BBS boundary.

The BBS data are intended for use in monitoring bird population trends, but it is also possible to use BBS data to develop a general estimate of the size of bird populations from the relative abundance. For geographic areas, BBS data (Sauer et al. 2017) can estimate relative abundance of different bird species over a particular time-frame (i.e., 1966-2015 or 2005-2015). If a population has been increasing or declining, the best estimate of relative abundance would come from recent data. For this EA, it was decided that relative abundance from BBS data for different geographic areas would be averaged for the last 10 years for the geographic area of the majority of bird population involved in BDM (2005 to 2015). For example, starlings, feral pigeons, House Sparrow, and Canada Goose populations are estimated at the statewide level since the majority of BDM projects in Kansas involve resident birds. For most other species, except the Rusty Blackbird, the Central Flyway population is estimated and used for analysis.

Using methods adopted by Partners in Flight to estimate population size with BBS data (Rich et al. 2004), the relative abundance of a bird population can be used to extrapolate a population estimate. The Partners in Flight system involves extrapolating the number of birds in the 50 quarter-mile circles (total area/route = 10 mi²). It also makes assumptions on the detectability of bird, which *varies* for each species. For example, some species that are large such as Canada Geese and vultures or vocalize frequently such as Mourning Doves and Northern Bobwhites are much more easily detected during bird surveys than species that are small and inconspicuous such as owls and Horned Larks, or do not vocalize that often or loudly during surveys such as Horned Larks and American Bitterns. Additionally, breeding males are often the most visible during surveys while females may be in cover or on a nest and not detected such as Red-winged Blackbirds. Given an idea about the detectability of a bird species, a population estimate can be obtained by relative abundance/mi²/detection percentage.

WS-Kansas will use BBS data from 2005 to 2015 to estimate populations that are impacted lethally by WS-Kansas BDM. WS-Kansas conducts BDM for most all species that are either residents in Kansas or primarily come from the Central Flyway which, for the purposes of this EA, will include the central BBS physiographic regions: 3, 4, 6-8, 19, 30, 32-40, 53-55, and 61 in the states and Canadian provinces of southern Alberta, eastern Colorado, Kansas, eastern Montana, Nebraska, far eastern New Mexico, North Dakota, Oklahoma, southern Saskatchewan, South Dakota, Texas, and eastern Wyoming (Figure 4). Additionally, some birds come from areas further north (primarily area 29) in Canada from the Central Flyway or, to a lesser extent, the Pacific, Mississippi, and Atlantic Flyways. The most appropriate population will be estimated for those species that WS-Kansas lethally controls in Kansas from most of the Central Flyway BBS Physiographic Regions. The physiographic regions provide the best estimates of populations because of the similarity of habitat within each region.

To determine impacts, all known take in the same area used to estimate the population will be analyzed in Section 4.1.1.1. WS-Kansas records or estimates take of species killed in BDM. Estimates of other take are made for species hunted or those species that are permitted to be taken under permits issued by USFWS to resolve depredations. In many cases, undocumented take can occur for species that are not protected (starling, feral pigeon, and House Sparrow) or have a USFWS depredation order (blackbirds, magpies, and crows) which allows take without a permit. For these species, an estimate of other take can be made, but is only be a guess; to be conservative, this estimate is likely over-estimated.

Many of the requests for assistance that WS-Kansas receives occur during winter when migratory birds have come into Kansas, thus changing bird population numbers. This larger area is used to determine impacts on the population. The National Audubon Society (NAS) conducts nationwide bird surveys within a few weeks of December 25th, the NAS Christmas Bird Counts (CBC). The CBC reflects the number of birds in Kansas during early winter that would occur after migrations are completed. The Christmas Counts are a volunteer effort conducted by all levels of birders and only provides the number seen in a 15 mile diameter circle (177 mi²). The Christmas bird count data does not provide a population estimate (numbers can be extrapolated for the area of coverage giving a very rough population estimate over a larger area), but can be used as an indicator of trend in the population or compared with other populations. CBC data often varies much more than BBS data due to variations in winter climate.

2.1.2 Effects of BDM on Nontarget Species Populations, Including T&E Species

A common concern among members of the public and wildlife professionals, including WS personnel, is the potential impacts of damage control methods and activities on nontarget species, particularly T&E species. WS-Kansas's operating policies include measures intended to reduce the effects of BDM activities on nontarget species populations and are presented in Chapter 3. For the last 4 FYs (FY2015-FY2018), WS-Kansas has not taken any known nontarget species as a result of BDM activities. The potential exists, but this illustrates the low probability.

In contrast to adverse impacts on nontarget animals from direct take by BDM methods, some nontarget species may actually benefit from BDM. Prime examples are the benefit to native cavity nesting bird species such as the Eastern Bluebird that results from any reduction in starling populations. A number of other bird species, including some T&E species, could benefit from reductions in populations of Brown-headed Cowbirds which parasitize nests of other birds.

2.1.2.1 Federally Listed T&E Species. Special efforts are made to avoid jeopardizing T&E species through biological evaluations of the potential effects and the establishment of special restrictions or mitigation measures. WS received a Programmatic BO in 2015 on the potential for WDM, in general and including most BDM methods currently used, to impact the species listed nationwide, including those in Kansas. USFWS, consulted under Section 7 of the ESA, issued BOs on the species that WS had the likelihood to adversely affect. WS abides by the reasonable and prudent measures and alternatives, and terms and conditions established in the BOs which reduce the potential for take. (USDA 2015, Appendix F). These will be discussed in the following individual accounts for listed species that could be affected by BDM.

In all, the Federal T&E species list for Kansas (Table 2) includes 3 mammals, 5 birds, 4 fish, 4 invertebrate, and 3 plants. WS-Kansas BDM will have no effect on listed mammals, fish, invertebrates, plants and birds according to the 2015 BO offered by the USFWS.

Table 2. T&E and candidate species federally listed in Kansas.

Species	Scientific Name	Status	Locale	BDM
Mammal				
Gray Bat	<i>Myotis grisescens</i>	E	Southeast	0
Northern-Long eared Bat	<i>Myotis septentrionalis</i>	T	East	0
Black footed Ferret	<i>Mustela nigripes</i>	E	West	0
Bird				
Whooping Crane	<i>Grus americana</i>	E	Statewide	-, 0, +
Red Knot	<i>Calidris canutus rufa</i>	T	Statewide	0
Piping plover	<i>Charadrius melodus</i>	T	Statewide	0
Least Tern (interior pop.)	<i>Sterna antillarum</i>	E	Statewide	+
Lesser prairie chicken	<i>Tympanachus pallidicinctus</i>	T	West	0
Fish				
Pallid Sturgeon	<i>Scaphirhynchus albus</i>	E	Northeast	0
Topeka Shiner	<i>Notropis tristis</i>	E	Statewide	0
Neosho Madtom	<i>Noturus placidus</i>	T	East	0
Arkansas River Shiner	<i>Notropis girardi</i>	T	Statewide	0
Invertebrate				
American Burying Beetle	<i>Nicrophorus americanus</i>	E	Southeast	0
Rabbitsfoot Mussel	<i>Quadrula cyndrilica</i>	T	Southeast	0
Neosho Mucket Mussel	<i>Lampsilis rafinesquenna</i>	E	Southeast	0
Spectaclecase Mussel	<i>Cumberlandia monodonta</i>	E	Southeast	0
Plants				

Mead's Milkweed	<i>Asclepias meadii</i>	T	East	0
Western Prairie Fringed Orchid	<i>Platanthera praeclara</i>	T	Northeast	0
Running Buffalo Clover	<i>Trifolium stoloniferum</i>	E	East-central	0

Whooping Crane. This species breeds in northern Canada and migrates through Kansas on their way to their wintering grounds in Texas. In Kansas, they are found during migration in October-November and March-April, primarily in the central area of the State. They associate with large open wetlands, croplands, and pastures, and have designated habitat in the central part of the State. The only BDM methods that were considered to have a potential negative impact on the whooping crane in the USFWS 2015BO (USDA 2015, Appendix F) would be the use of avicides on grain baits in areas where the cranes Avitrol[®], in areas where the crane would be found or have access to them. Thus, USFWS did not believe that WS would have an impact on this species, and as a result, did not issue an Incidental Take Statement for them.

2.1.2.2 State Listed T&E Species. KWPD (2018) lists animals that are considered T&E in Kansas. This list contains most all federally listed species. It also lists a few additional species. WS-Kansas will have no effect on Kansas listed mammals (1), reptiles (3), amphibians (12), fish (11), and invertebrates (10). KWPD lists 4 species of birds as T&E, and all but 1 is also federally listed and discussed above. The 1 additional species being the Snowy Plover. WS-Kansas did not conduct BDM for any of the T&E species mentioned above from FY15 to FY18. WS-Kansas did haze a Snowy Plover from an air operating area in FY06 at an airport. As discussed above, this would be beneficial since these species could be killed by aircraft. WS-Kansas would discuss needed hazing efforts with KDWP and obtain appropriate permits as necessary, if these species were found in an air operating area of an airport where WS-Kansas was conducting operational BDM. Neither species would be expected to be impacted incidentally in BDM. However, the falcon as well as the plover (as has been shown) could be the target of hazing at an airport where they were in the air operating area. Additionally, as with the Piping Plover, control of predatory birds such as gulls that have been found to be significantly impacting nesting success at a breeding colony could also benefit the Snowy Plover.

Bald Eagle. The Bald Eagle was delisted as a threatened species from the federal list of T&E species but are still protected under the Bald and Golden Eagle Protection Act of 1940. Bald Eagles are generalized predators and scavengers primarily adapted to edges of aquatic habitats. They feed primarily on fish (taken both alive and as carrion), waterfowl, mammalian carrion, and small birds and mammals. The Bald Eagle is a wide-ranging raptor found in all lower 48 contiguous states during some point in its life cycle. It is a bird of aquatic ecosystems, frequenting estuaries, large lakes, rivers, reservoirs and some seacoast habitat. Bald Eagles currently nest in 47 of 48 contiguous states including Kansas, and their numbers continue to increase from a low of about 500 nesting pairs in the mid-1960's to over 6,000 pairs today. They are a common winter resident in Kansas on lakes and rivers throughout the State. BDM has very minimal potential to negatively impact Bald Eagles and none have been taken by WS-Kansas. The only BDM method that would potentially take a Bald Eagle is a raptor trap set for other large raptors such as Turkey Vultures. However, all raptor traps are live traps and monitored frequently enough to release nontargets, and therefore, if an eagle was ever taken, it could be released.

2.1.3 Effects of BDM on Public and Pet Safety and the Environment

WS-Kansas uses a variety of methods when conducting BDM. WS-Kansas personnel have operating policies to reduce potential safety impacts from BDM to the public and the environment. WS-Kansas relies on its personnel to use their professional judgment to determine the most effective methods to use in a given bird damage situation, while having minimal, if any, impact to people and the environment. WS-Kansas Specialists are professionally trained to use BDM techniques, especially those have the

potential to impact themselves, the public, and the environment. Several BDM methods have the potential to be hazardous including firearms, pyrotechnics, and avicides. Chapter 3 lists measures that WS-Kansas implements to reduce potential problems.

Some individuals have expressed concerns that they believe that chemical BDM methods could adversely affect people and pets from direct exposure or indirectly from birds that have died from chemical use. Under the proposed alternatives in this EA, the avicides that WS-Kansas could use are DRC-1339, an avicide used to remove damaging feral pigeons, starlings, crows or blackbirds, and Avitrol® for House Sparrows and feral pigeons. Chemical repellents that could be used under the proposed action include methyl-anthranilate (MA), an artificial grape flavoring used in the food industry that repels many bird species, methiocarb (Mesurol®) used in eggs to repel corvids from raiding nests of other birds, and polybutene products which are bird repellents that have a tactile, sticky consistency to touch and are applied directly to problem locations to prevent birds such as feral pigeons from perching. Avicides and chemical repellents are regulated under FIFRA by EPA, the Kansas Pesticide Law, and by WS Directives. WS-Kansas applicators are certified by the state, and must complete a written examination and undergo recurrent training. Other chemical methods that could be used are the tranquilizer A-C, used to capture waterfowl and a wide variety of other species, and euthanizing drugs such as Fatal Plus®. These drugs are regulated by FDA under the Food, Drug, and Cosmetic Act and WS policy. The chemicals used by WS-Kansas from FY15 to FY18 are shown in Table 3 with the species they were used to control. WS-Kansas used an average of about 0.4 pounds of DRC-1339, and 0 ounces of Avitrol®. This is a minimal use of chemicals.

Table 3. Chemicals used by WS-Kansas in BDM from FY15 to FY18. Avian toxicants (DRC-1339 and Avitrol®) are registered for use by EPA and euthanasia (Fatal Plus®) drugs through FDA.

Species	Chemical	FY15	FY16	FY17	FY18	Ave.
European Starling	DRC-1339 (g)	0	230	0	500	182.5
Feral Pigeon		0	0	8	0.56	2.14
TOTAL DRC-1339 USED		0	230	8	500.56	182.64
House Sparrow	Avitrol® (oz)	0	-	-	-	0
European Starling		0	-	-	-	0
Feral Pigeon		0	-	-	-	0
TOTAL AVITROL USED		0	0	0	0	0

Some people may be concerned that WS' use of firearms and pyrotechnic bird scaring devices could cause injuries to people. WS-Kansas personnel occasionally use small caliber firearms or air rifles and shotguns to remove feral domestic pigeons and other birds that are causing damage, and would continue to use such firearms in bird damage situations. WS policy requires standard procedures for training, safe use, storage and transportation of firearms as prescribed by the WS Firearms Safety Training Manual (WS Directive 2.615). The required firearms training is conducted annually by certified instructors. Hands-on firearms proficiency is evaluated in the field and candidates must pass a written exam. Therefore, firearms are handled in a safe manner with consideration given to the proper firearm to be utilized, the target density, backstop and unique field conditions. Pyrotechnics often emit sparks when launched, creating some potential fire hazard to private property from field use. Before the implementation of formalized training standards, other states reported incidents where small fires were started from the use of pyrotechnics in the field. Pyrotechnics storage, transportation, and use are regulated by the Alcohol, Tobacco and Firearms Bureau, Department of Transportation, and WS policy respectively. WS requires adherence to all Federal, State and local laws. Pyrotechnics on-hand are less than 50 lbs. in total weight; that, along with industry approved packaging of the materials allow Kansas WS' pyrotechnics to be classified as Division 1.4 (formally known as Class C), the lowest classification of explosive materials as defined by the Alcohol, Tobacco and Firearms Bureau. Pyrotechnics are stored and transported in

approved metal boxes. Training for pyrotechnics field use is also conducted and maintained under the WS Firearms Safety Training Manual guidelines.

A formal risk assessment of WS methods concluded low risks to humans (USDA 2017, Appendix P) including BDM methods used by WS-Kansas such as toxicants, repellents, immobilization drugs, firearms, pyrotechnics, and traps. Under the proposed action, WS-Kansas could use DRC-1339, Avitrol[®], and euthanasia drugs such as Fatal Plus[®]. From FY15 to FY18 WS-Kansas used an annual average of 246grams of DRC-1339, 0 oz. of Avitrol[®]. This is very minimal use of chemicals. Based on a thorough Risk Assessment, WS concluded that when WS chemical methods including those referenced above are used in accordance with label directions, they are highly selective for the target individuals or populations. WS use of these pesticides in BDM has negligible impacts on the environment and do not represent a risk to the public (USDA 2017).

On the other hand, public health and safety may be jeopardized by not having a full array of BDM methods for responding to complaints involving threats to human health and safety such as bird airstrike hazards and a disease outbreak. Many bird species such as raptors, gulls, and starlings have been struck by aircraft and represent a significant strike risk to aircraft at airports and have been struck by aircraft. This can result in aircraft damage and injuries to people. Additionally diseases, especially the potential for HP H5N1 AI, could be a significant threat to humans. Surveillance of this disease is being conducted in much of the United States in migratory birds to monitor for its presence. WS often uses several BDM methods to capture target animals, depending on the specifics of these types of situation. Firearms, traps, mist nets, or chemical immobilization or toxicants may be used to take a target bird. BDM methods that may pose a slight public safety risk may be used safely and effectively to eliminate or monitor for a recognized public safety risk.

One peripheral factor pertinent to assessing the risk of adverse effects of WS-Kansas BDM activities is the potential for adverse effects from not having professional assistance from programs like WS-Kansas available to private entities that express needs for such services. WS-Kansas operates to assist individuals with damage from birds where a need exists. In the absence of a program, or where restrictions prohibit the delivery of an effective program, it is most likely that BDM would be conducted by other entities such as private individuals. Private BDM activities are less likely to be as selective for target species, and less likely to be accountable. Additionally, private activities may potentially increase the use of unwise or illegal methods to control birds. For example, Great-tailed Grackles were illegally poisoned in Texas with dicotophos (Mitchell et al. 1984) and a corporation in Kentucky was fined for illegally using carbofuran to destroy unwanted predators including raptors at a private hunting club (Porter 2004). Similarly, on a Georgia quail plantation, predatory birds were being killed by eggs that had been injected with carbofuran (the Federal Wildlife Officer 2000); in Oklahoma, Federal agents charged 31 individuals with illegally trapping and killing hawks and owls to protect fighting chickens (USFWS 2003). The Texas Department of Agriculture (2006) has a website and brochure devoted solely to preventing pesticide misuse in controlling agricultural pests. Similarly, the Britain Department for Environment, Food and Rural Affairs (2004) has a “Campaign against Illegally Poisoning of Animals.” Therefore, WS-Kansas believes that it is in the best interest of the public, pets, and the environment that a professional BDM program be available because private resource owners could elect to conduct their own control rather than use government services and simply out of frustration potentially resort to using inadvisable techniques.

2.1.4 Effects of BDM on Aesthetics

Some individual members or groups of wild and feral domestic bird species habituate and learn to live in close proximity to humans. Some people in these situations feed such birds or otherwise develop emotional attitudes toward such animals that result in aesthetic enjoyment. In addition, some people consider individual wild birds as “pets,” or exhibit affection toward these animals. Examples would be people who visit a city park to feed waterfowl or pigeons and homeowners who have bird feeders or bird houses. Other people do not develop emotional bonds with individual wild animals, but experience aesthetic enjoyment from observing them. Public reaction to BDM actions is variable because individual members of the public can have widely different attitudes toward wildlife. Some individuals that are negatively affected by wildlife support removal or relocation of damaging wildlife. Other individuals affected by the same wildlife may oppose removal or relocation. Individuals unaffected by wildlife damage may be supportive, neutral, or opposed to wildlife removal depending on their individual personal views and attitudes.

Some people do not believe that birds such as nesting Canada Geese or nuisance egret, blackbird, or starling roosts should even be harassed to stop or reduce damage problems. Some of them are concerned that their ability to view migratory birds is lessened by WS-Kansas nonlethal harassment activities. The public’s ability to view wild birds in a particular area would be more limited if the wildlife are removed or relocated. However, immigration of wildlife from other areas could possibly replace the animals removed or relocated during a BDM activities. In addition, the opportunity to view or feed other wildlife would be available if an individual makes the effort to visit other parks or areas with adequate habitat and local populations of the species of interest.

Property owners that have pigeons roosting or nesting on their buildings or waterfowl grazing on turf areas are generally concerned about the negative aesthetic appearance of bird droppings and the damage to their buildings, turf, or other property. Business owners generally are particularly concerned because negative aesthetics can result in lost business. Costs associated with property damage include labor and disinfectants to clean and sanitize fecal droppings, implementation of nonlethal wildlife management methods, loss of property use, loss of aesthetic value of flowers, gardens, and lawns consumed by birds such as geese, loss of customers or visitors irritated by the odor of or of having to walk on fecal droppings, repair of golf greens, replacing grazed turf, and loss of time contacting local health departments and wildlife management agencies on health and safety issues.

2.2 ISSUES CONSIDERED BUT NOT IN DETAIL WITH RATIONALE

Following are additional issues that that have been considered during the preparation of this EA but will not be considered for inclusion under the alternatives in this EA with rational provided.

2.2.1 Appropriateness of Preparing an EA (Instead of an EIS) For Such a Large Area.

Some individuals might question whether preparing an EA for an area as large as Kansas would meet the NEPA requirements for site specificity. WS' mission is to manage damage caused by wildlife, not overall wildlife populations. As an agency that exists to manage specific types of damage, WS-Kansas can predict the types of locations or situations where damage is likely to occur. However, due to any number of variable circumstances, WS-Kansas has no absolute control over when a request for BDM assistance will be received nor can WS-Kansas predict specific, individual times and locations of most bird damage situations. Therefore, WS-Kansas must be ready and able to provide assistance on short notice about anywhere in Kansas. The missions of other federal and state wildlife management agencies generally concentrate on management for wildlife abundance and are not equipped or prepared to prevent bird damage problems without resorting to extreme and extensive population management strategies that, in most cases, would be neither prudent nor affordable. Given the numbers of birds, past experiences and program activity monitoring, WS-Kansas believes this EA addresses most potential needs and issues associated with providing BDM at any given location.

If a determination is made through this EA that the proposed action would have a significant environmental impact, then an EIS would be prepared. In terms of considering cumulative impacts, one EA analyzing impacts for the entire State may provide a better analysis than multiple EA's covering smaller zones, especially considering the mobility of birds and impacts on their populations.

2.2.2 Effects from the Use of Lead in Ammunition

WS-Kansas primarily uses nontoxic shot (e.g., steel and bismuth) for most of its BDM activities but occasionally uses lead shot, and lead bullets for ground-based shooting. WS-Kansas uses nontoxic shot for all migratory birds shot under the authority of a permit issued by USFWS and in areas where there is a potential risk to T&E or sensitive species such as Bald Eagles. In general, sport hunting using rifles or shotguns, which would be similar in nature to ground-based shooting by WS-Kansas with regard to dispersal of lead shot, tends to spread lead over wide areas and at low concentrations (Craig et al. 1999). The primary concerns raised thus far about sport hunting and lead shot contamination have been focused on aquatic areas where waterfowl hunting occurs, and the feeding habits of many species of waterfowl that result in them picking up and ingesting shot from the bottoms of ponds, lakes, and marshes. Shooting of lead shot in dry land upland areas has not raised similar levels of concern except where such activities are more intensively concentrated such as those which can occur with dove hunting at harvested crop fields and with game bird hunting at "shooting preserves" (Kendall et al. 1996). In an ecological risk assessment of lead shot exposure in non-waterfowl bird species, ingestion of lead shot was identified as the exposure mode of concern rather than just contact with lead shot or lead leaching from lead shot distributed in the environment (Kendall et al. 1996). Shots fired during WDM activities in Kansas are scattered in distribution over relatively wide areas in mostly uninhabited locations where contact with humans or ingestion by birds picking up grit to aid in digestion of food are highly unlikely.

Questions have arisen about the deposition of lead into the environment from ammunition used in firearms to remove birds lethally. As described in Appendix B, the lethal removal of birds with firearms by WS to alleviate damage or threats could occur using a shotgun or rifle, including an air rifle. In an ecological risk assessment of lead shot exposure in non-waterfowl birds, ingestion of lead shot was identified as the concern rather than just contact with lead shot or lead leaching from shot in the environment (Kendall et al. 1996). To address lead exposure from the use of shotguns, the USFWS Migratory Bird Permit Program has implemented the requirement to use non-toxic shot as defined under

50 CFR 20.21(j) as part of the standard conditions of depredation permits issued pursuant to the MBTA for the lethal take of birds under 50 CFR 21.41. In 2011, the depredation order for blackbirds (see 50 CFR 21.43(b)) was amended to include the requirement for use of non-toxic shot, as defined under 50 CFR 20.21(j), in most cases. However, this prohibition does not apply if an air rifle, an air pistol, or a .22 caliber rimfire firearm was used for removing depredating birds under the depredation order. To alleviate concerns associated with lead exposure in wildlife, WS would only use non-toxic shot as defined in 50 CFR 20.21(j) when using shotguns.

The take of birds by WS in the state would occur primarily from the use of shotguns. However, the use of rifles and air rifles could be employed to remove some species. To reduce risks to human safety and property damage from bullets passing through birds, the use of rifles and air rifles would be applied in such a way (*e.g.*, caliber, bullet weight, distance) to ensure the bullet does not pass through birds, and if the bullet does pass through or misses the target, it impacts in a safe location. Birds that were removed using rifles and air rifles would occur within areas where retrieval of all bird carcasses for proper disposal would be highly likely (*e.g.*, at roost sites). With risks of lead exposure occurring primarily from ingestion of bullet fragments and lead shot, the retrieval and proper disposal of bird carcasses would greatly reduce the risk of scavengers ingesting or being exposed to lead that may be contained within the carcass.

However, deposition of lead into soil could occur if, during the use of a rifle or air rifle, the projectile passes through a bird, if misses occur, or if the bird carcass is not retrieved. Laidlaw et al. (2005) reported that, because of the low mobility of lead in soil, all of the lead that accumulates on the surface layer of the soil is generally retained within the top 20 cm (about 8 inches). In addition, concerns occur that lead from bullets deposited in soil from shooting activities could lead to contamination of ground water or surface water. Stansley et al. (1992) studied lead levels in water that was subjected directly to high concentrations of lead shot accumulation because of intensive target shooting at several shooting ranges. Lead did not appear to “*transport*” readily in surface water when soils were neutral or slightly alkaline in pH (*i.e.*, not acidic), but lead did transport more readily under slightly acidic conditions. Although Stansley et al. (1992) detected elevated lead levels in water in a stream and a marsh that were in the shot “*fall zones*” at a shooting range, the study did not find higher lead levels in a lake into which the stream drained, except for one sample collected near a parking lot. Stansley et al. (1992) believed the lead contamination near the parking lot was due to runoff from the lot, and not from the shooting range areas. The study also indicated that even when lead shot was highly accumulated in areas with permanent water bodies present, the lead did not necessarily cause elevated lead levels in water further downstream. Muscle samples from two species of fish collected in water bodies with high lead shot accumulations had lead levels that were well below the accepted threshold standard of safety for human consumption (Stansley et al. 1992).

Craig et al. (1999) reported that lead levels in water draining away from a shooting range with high accumulations of lead bullets in the soil around the impact areas were far below the “*action level*” of 15 parts per billion as defined by the EPA (*i.e.*, requiring action to treat the water to remove lead). The study found that the dissolution (*i.e.*, capability of dissolving in water) of lead declines when lead oxides form on the surface areas of the spent bullets and fragments (Craig et al. 1999). Therefore, the transport of lead from bullets or shot distributed across the landscape is reduced once the bullets and shot form crusty lead oxide deposits on their surfaces, which naturally serves to reduce the potential for ground or surface water contamination (Craig et al. 1999). Those studies suggest that, given the very low amount of lead being deposited and the concentrations that would occur from WS’ activities to reduce bird damage using rifles, as well as most other forms of dry land hunting in general, lead contamination from such sources would be minimal to nonexistent.

Because the take of birds could occur by other entities during regulated hunting seasons, through the issuance of depredation permits, under depredation/control orders, or without the need to obtain a depredation permit, WS' assistance with removing birds would not be additive to the environmental status quo. WS' assistance would not be additive to the environmental status quo because those birds removed by WS using firearms could be lethally removed by the entities experiencing damage using the same method in the absence of WS' involvement. The amount of lead deposited into the environment may be lowered by WS' involvement in activities due to efforts by WS to ensure projectiles do not pass through, but are contained within the bird carcass, which would limit the amount of lead potentially deposited into soil. The proficiency training received by WS' employees in firearm use and accuracy increases the likelihood that birds are lethally removed humanely in situations that ensure accuracy and that misses occur infrequently, which would further reduce the potential for lead to be deposited in the soil from misses or from projectiles passing through carcasses. In addition, WS' involvement would ensure efforts were made to retrieve bird carcasses lethally removed using firearms to prevent the ingestion of lead in carcasses by scavengers. WS' involvement would also ensure carcasses were disposed of properly to limit the availability of lead. Based on current information, the risks associated with lead bullets that would be deposited into the environment from WS' activities due to misses, the bullet passing through the carcass, or from bird carcasses that may be irretrievable would be below any level that would pose any risk from exposure or contamination. As stated previously, when using shotguns, only non-toxic shot would be used by WS pursuant to 50 CFR 20.21(j). Additionally, WS may utilize non-toxic ammunition in rifles and air rifles as the technology improves and ammunition become more effective and available.

2.2.3 Impacts of Hazing Programs on Livestock

Some individuals have raised concerns that noise from pyrotechnics used to harass birds could startle livestock and cause problems such as injuring themselves running through fences. Some dairy operators have voiced concerns that startling effects from sound-scare devices could adversely affect milk production. WS' personnel trained and experienced in using pyrotechnics have noted that in their experience, most animals habituate relatively easily to noises from the pyrotechnics. However, personnel avoid shooting pyrotechnics near identified livestock facilities where operators have expressed concerns.

2.2.4 National Historic Preservation Act, American Indian, and Cultural Resource Concerns

NHPA requires federal agencies to evaluate the effects of any federal undertaking on cultural resources and determine whether they have concerns for cultural properties in areas of these federal undertakings. In most cases as discussed in Section 1.7.2, WDM activities have little potential to cause adverse affects to sensitive historical and cultural resources. If a BDM activity with the potential to affect historic resources is planned under the selected alternative in the decision for this EA, then an individual site-specific consultation as required by Section 106 of the NHPA would be conducted as necessary. The proposed action would not cause major ground disturbance, does not cause any physical destruction or damage to property, wildlife habitat, or landscapes, and does not involve the sale, lease, or transfer of ownership of any property. In general, the proposed methods also do not have the potential to introduce visual, atmospheric, or audible elements to areas in which they are used that could result in effects on the character or use of historic properties. Harassment techniques that involve noise-making could have a primary effect that would be beneficial at the damage site. The use of these devices is usually short term and could be discontinued if a conflict arose with the use of historic property. Therefore, the BDM methods that WS-Kansas would use under the proposed action are not the types of activities that would have the potential to affect historic properties.

The Native American Graves and Repatriation Act of 1990 provides protection of American Indian burial sites and establishes procedures for notifying Tribes of any new discoveries. Senate Bill 61, signed in 1992, sets similar requirements for burial protection and Tribal notification with respect to American Indian burials discovered on state and private lands. If a WS-Kansas employee locates a burial site, the employee would notify the appropriate Tribe or official. WS-Kansas will only conduct BDM activities at the request of a Tribe or their lessee and, therefore, the Tribe should have ample opportunity to discuss cultural and archeological concerns with WS-Kansas. However, in consideration of Kansas' Native Americans, WS-Kansas has included all of the recognized Tribes in Kansas on the mailing list for this EA to solicit their comments.

2.2.5 Concerns that Killing Wildlife Represents “Irreparable Harm”

Public comments have raised the concern that the killing of any wildlife represents irreparable harm. Although an individual bird or multiple birds in a specific area may be killed by WS-Kansas BDM activities, this does not in any way irreparably harm the continued existence of these species. Wildlife populations experience mortality from a variety of causes, including human harvest and depredation control, and have evolved reproductive capabilities to withstand considerable mortality by replacing lost individuals. Kansas' historic and current populations of big game animals, game birds, furbearers and unprotected birds, which annually sustain harvests of thousands of animals as part of the existing human environment, are obvious testimony to the fact that the killing of wildlife does not cause irreparable harm. Populations of some of these species are in fact much higher today than they were several decades ago (e.g., white-tailed deer (*Odocoileus virginianus*)), in spite of liberal hunting seasons and the killing of hundreds or thousands of these animals annually. The legislated mission of USFWS and KDWP is to preserve, protect, and perpetuate all the wildlife in the United States and Kansas. Therefore, USFWS and KDWP would be expected to regulate killing of protected wildlife species in the State to avoid irreparable harm. Our analysis, herein, shows that the native species WS-Kansas takes in BDM will continue to sustain viable populations. Thus, losses due to human-caused mortality are not “irreparable.”

2.2.6 Concerns that the Proposed Action May Be “Highly Controversial” and Its Effects May Be “Highly Uncertain,” Both of Which Would Require That an EIS Be Prepared

The failure of any particular special interest group to agree with every act of a Federal agency does not create a controversy, and NEPA does not require the courts to resolve disagreements among various scientists as to the methodology used by an agency to carry out its mission (*Marsh vs. Oregon Natural Resource Council*, 490 U.S. 360, 378 (1989)¹). As was noted in the previous Finding of No Significant Impact and Record of Decision for the prior EA (WS 2001), “*The effects on the quality of the human environment are not highly controversial. Although there is some opposition to BDM, this action is not highly controversial in terms of size, nature, or effect.*” If in fact a determination is made through this EA that the proposed action would have a significant environmental impact, then an EIS would be prepared.

2.2.7 Impacts on the Natural Environment Not Considered

USDA (1997) evaluated many WS-Kansas BDM activities for their impacts on several other natural environmental factors not discussed above. USDA (1997) concluded that WS would have negligible impacts on air quality from the use of WDM methods. In addition, the proposed action does not include construction or discharge of pollutants into waterways and, therefore, would not impact water quality or require compliance with related regulations or Executive Orders. The proposed action would cause only very minimal or no ground disturbance and, therefore, would impact soils and vegetation insignificantly.

2.2.8 Effects of BDM on Water Quality and Wetlands.

Potential for BDM Chemicals to Run off site and Affect Aquatic Organisms. An issue that was raised during an interagency discussion while working on the previous EA (WS 2001) was the potential for BDM chemicals to affect water quality to the point that adverse affects on humans or aquatic organisms might occur. This issue overlaps with “effects on human health” identified in section 2.1.3. Under the current WS-Kansas BDM program, WS-Kansas would use DRC-1339 in accordance with EPA-approved label directions. USDA (1997, Appendix P) contains information pertinent for analyzing the potential for effects on water quality from use of this chemical and is incorporated by reference. This chemical is very soluble in water (one liter can dissolve 91 grams). Based on this solubility, it appears that DRC-1339 has a high potential to be transported from sites where it is used. However, DRC-1339 degrades rapidly under both aerobic and anaerobic conditions in soils with a half-life of less than two days. This degradation process is likely to diminish concentrations before the chemical migrates to groundwater or off-site surface water areas. Continued degradation would be more than 90% degraded within about one week based on a half-life of two days.

Available information suggests DRC-1339 has low potential for aquatic and invertebrate toxicity (USDA 1997). Aquatic toxicity of DRC-1339 to water fleas occurred at 1.6 mg/L (Marking and Chandler 1981, Blasberg and Herzog 1991). The majority of LC₅₀ (lethal concentration of a chemical in water in mg/L that is expected to kill 50 percent of the test subjects of a given species) values ranged from 6 to 18 mg/L for such species as glass shrimp, snails, crayfish, and Asiatic clams (Marking and Chandler 1981). LC₅₀ values for bluegill and catfish ranged from 21 to 38 mg/L (USDA 1997, Appendix P). The greatest quantity that might be used by WS-Kansas at an individual site at any one time is expected to be 16

¹ Court cases not given in Literature Cited section.

ounces (454g). If all of the 16 ounces of chemical was transported off site and made it to surface or ground water, the water supply would have to be no more than 75,000 gallons in size to present a 50% lethal hazard to water fleas, no more than 6,700 to 20,000 gallons in size to present such a hazard to other invertebrates, or no more than 3,200 to 5,700 gallons to present such a hazard to bluegills or catfish. Put in perspective, 75,000 gallons is equivalent to a pond that is about 65 feet across and averages only 3 feet deep. These water volumes are much smaller than are likely to be encountered in streams or lakes in the area, and, undoubtedly, only a tiny fraction of the ground-water supply in the area. Because treated bait material is not applied unless target birds are already taking a similar amount of untreated bait, it is highly unlikely that much, if any, of the chemical would be left on the ground where it would be subjected to off-site transport by rainfall. The risk is further mitigated by the fact that the chemical degrades rapidly as discussed above. USDA (1997, Appendix P) concluded no probable risk to aquatic organisms. This analysis further indicates that the low quantities used at any one site, rapid degradation, and dilution factors act together to virtually eliminate any potential for hazard to humans or aquatic organisms due to possible run-off or ground water. Therefore, WS-Kansas concluded in the previous EA (WS 2008) that the use of DRC-1339 would not cause runoff problems or affect aquatic organisms.

The other primary chemical used by WS-Kansas, Avitrol[®], is used minimally and, thus, would not likely cause problems under the current program, especially used according to label directions. Avitrol[®] is available as a prepared grain bait mixture that is mixed in with clean bait at a no greater than 1:9 treated to untreated mixture of bait kernels or particles. Several factors virtually eliminate health risks to members of the public or to water quality from the use of this product as an avicide:

- It is readily broken down or metabolized into removable compounds that are excreted in urine in the target species (Extension Toxicology Network 1996). Therefore, little of the chemical remains in killed birds to pose contamination risks to water supplies.
- Although Avitrol[®] has not been specifically tested as a cancer-causing agent, the chemical was not found to be mutagenic in bacterial organisms (EPA 2007). Therefore, the best scientific information available indicates it is not a carcinogen. Regardless, however, the controlled and limited circumstances in which Avitrol[®] is used would prevent exposure of members of the public to this chemical or contamination of water supplies.
- Since Avitrol[®] is commercially available, it has already undergone extensive governmental environmental review for potential water quality impacts.

However, this chemical would likely be used much more by private individuals under the other alternatives because it would be the only legal avicide available. Therefore, it can be concluded that the current program would have the least risk. Additionally, WS-Kansas uses Avitrol[®] according to the label, and therefore, concludes that its use poses no or minimal risks, at most, to aquatic sites and organisms.

Potential to Cause Accelerated Eutrophication of Wetland Areas. This latter concern is based on the possibility that carcasses of birds killed by lethal control actions might significantly increase nutrients in marsh roosting areas, resulting in accelerated eutrophication. Eutrophication is the natural process by which lakes and ponds become more productive in terms of the amount of life (i.e., “biomass”) they can support. If this process is accelerated by man-caused activities that increase nutrients in an aquatic ecosystem, the increased amount of plant material that is produced as a result may lead to increases in decomposition of organic material which can reduce oxygen content in the water and lead to loss of certain species in the area or changes in species composition. WS-Kansas use of DRC 1339 (246 grams/year) is very minimal and would have no impact on accelerated eutrophication of wetlands from starlings or blackbirds coming back to roost after consuming DRC-1339

Blackbirds and starlings deposit large quantities of fecal material into nighttime roost sites. If no birds were killed by WS, then they would continue to roost and deposit fecal material into cattail marsh roosts for the entire winter roosting period. Therefore, this analysis looks at a comparison between the amount of nutrients that would be deposited by bird carcasses killed in control actions and the amount of nutrients in the bird droppings those same birds would deposit if they were not killed.

Hayes and Caslick (1984) reported average weights of Red-winged Blackbirds of about 49 grams (56 g for males, 39 g for females). The average weight of a European Starling is about 87 g (Blem 1981). Three million starlings and one million blackbirds killed and falling into cattail marsh roost sites would therefore weigh about 261,000 and 49,000 kg, respectively. The lean dry weight (excluding the weight of water, fat, and feathers) of starlings is about 24% of the whole weight (calculated from data in Blem 1981). A literature search produced no similar statistic for Red-winged Blackbirds; however, data for another passerine species (White-crowned Sparrow) was found in Chilgren (1977) which indicated lean dry weight is probably about 21% of whole weight for Red-winged Blackbirds. Under these assumptions, the lean dry weight of the 261,000 kg of starling carcasses and 49,000 kg of Red-winged Blackbird carcasses would be about 73,000 kg.

Key nutrients that contribute to wetland eutrophication include carbon, nitrogen, phosphorus, and potassium (Cole 1975). Data on the amounts of these nutrients in Red-winged Blackbird and starling carcasses could not be located in the literature. However, Chilgren (1985) determined that the amount of nitrogen in lean dry mass of White-crowned Sparrows ranged from 12 to 14%. The dry weight of plumage in that species was found to be about 19 to 25% of lean dry mass (Chilgren 1985), and the quantity of nitrogen in the feathers of that species has been reported to be about 15% of the dry plumage weight (Murphy and King 1982). Assuming that these statistics are about the same for starlings and blackbirds, then the weight of nitrogen deposited in marsh areas because of birds killed by WS-Kansas would total about 13,000 kg (about 3,000 kg of this would be from the feathers).

Based on data from Hayes and Caslick (1984), the dry weight of nitrogen, phosphorus, and potassium from the nightly droppings of red-winged blackbirds averages about 67, 10.5, and 9.9 mg per bird, respectively. Starlings excrete about 1.5 times as much as red-winged blackbirds (Hayes and Caslick 1984). Estimates of the total number of blackbirds and starlings roosting at individual cattail marsh roost sites in winter have been as high as 9 to 12 million (Zimmerman 1990). The total amount of nitrogen excreted by that many birds over a 3-month wintering period would be in the range of 70,000 to 100,000 kg. Under these assumptions, if the 3 million starlings and 1 million Red-winged Blackbirds were not killed in BDM actions, they would deposit about 33,000 kg of nitrogen (about 27,000 kg from starlings and about 6,000 kg from blackbirds) into the marsh habitat over a 3-month wintering period. This is more than 2.5 times the amount of nitrogen that would be deposited by the carcasses of the birds if they were killed by BDM actions.

This analysis indicates that continuing the current program would most likely result in a *reduction* in the amount of at least one primary nutrient (nitrogen) in cattail marsh ecosystems used as nighttime roosts. A net reduction of about 20,000 kg of nitrogen (33,000 kg with no control vs. 13,000 kg if control is conducted) would be expected as a result of bird control actions. This would be a minor overall reduction in the total amount of nutrients contributed to the marsh over the winter. If BDM actions killed the birds later in the season, then at most an additional 10,000 kg of nitrogen would be deposited into the marsh habitat via bird carcasses. This would not be a noticeable increase in the amount of nitrogen deposited by the entire roosting population during the course of the winter and would be well within the range of variability that would be expected to occur based on population fluctuations. Also, as pointed out below, nitrogen is rarely a limiting factor among the nutrients necessary to cause accelerated eutrophication, because it is generally available from the air via precipitation (Cole 1975).

Other major nutrients that contribute to plant production (and thus, potentially, eutrophication) in freshwater ecosystems are carbon, phosphorus, and potassium (Cole 1975). The amount of carbon in passerine bird carcasses has been reported to range from 42 to 50% of lean dry mass (Chilgren 1985). Assuming the statistic for blackbirds and starlings is at the upper end of this range, the maximum amount of carbon that would be deposited in cattail marsh roosting areas by bird carcasses killed by WS-Kansas would be about 37,000 kg. Assuming, hypothetically, that these were distributed over only one of the known larger cattail marshes used by wintering blackbirds and starlings in Kansas (e.g., the 13,000 acre Cheyenne Bottoms State Wildlife Area), then, at most, this would amount to about 7 kg/ha (6.2 lb./acre) of carbon contributed to a wetland ecosystem. Primary production of vegetation in cattail marshes has been reported to range from 13,000 to 15,000 kg /ha (11,600 to 13,400 lb./acre) dry weight (Bernard and Fitz 1979). Considering the productivity of cattail marsh habitats and the large amounts of vegetative and animal biomass already present, the additional amount of carbon input from bird carcasses should not be a significant increase over the amounts already present in the system. In addition, carbon is rarely a limiting factor among nutrients available to cause eutrophication because it is generally readily available to plants in the form of carbon dioxide in the air (Cole 1975).

Phosphorus is frequently the limiting nutrient in freshwater systems (Cole 1975). Therefore, increases in phosphorus are frequently the primary cause of accelerated eutrophication. The amount of phosphorus in carcasses of starlings, blackbirds, or other passerine bird species was not found in the literature. However, Williams et al. (1978) reported that phosphorus content in the oven-dried carcasses of chicks of four species of penguins ranged from 3,000 to 22,500 ppm (parts per million). Potassium content was reported to range from 700 to 12,900 ppm. Assuming the higher end of these ranges would apply to blackbirds and starlings (to err on the side of overestimating), the 73,000 kg (dry weight) of blackbird and starling carcasses that might be killed and deposited in a cattail marsh roost site would put as much as 1,650 kg of phosphorus and 940 kg of potassium into the particular wetland ecosystem affected. On the other hand, if they were not killed, those same birds would deposit about 5,000 kg of phosphorus and 4,900 kg of potassium over a 90-day wintering period via droppings (based on Hayes and Caslick 1984). Therefore, it appears that the limited use of DRC-1339, as proposed herein, would not result in any net increase in the two nutrients in wetland ecosystems. This means that accelerated eutrophication would not be expected to occur from BDM activities.

The amounts of phosphorus and potassium in the vegetation of cattail marshes have been estimated to average about 44 and 220 kg/ha (39 and 196 lb./acre), respectively (Bernard and Fitz 1979). As an example, one of the larger known cattail roosting areas in the State is about 13,000 acres in size (e.g., the Cheyenne Bottoms State Wildlife Area). Assuming, hypothetically, that bird carcasses killed during BDM activities were distributed over that area alone, then, at most, this would add only about 0.3 kg of phosphorus per hectare /ha (0.3 lb./acre) to the local ecosystem. The amount added by bird droppings by those same birds if they were not killed would be about 1.0 kg/ha over a 3-month wintering period. These numbers are only about 0.7% (for carcasses) and 2.3% (for droppings) of the amount of phosphorus that would normally already be in the system, which suggests that the birds affected by BDM, whether killed or not, would not contribute substantially to the phosphorus load in the marsh. As stated above, phosphorus is usually the limiting nutrient that, when increased, is a frequent cause of accelerated eutrophication. Therefore, it appears that neither killing nor protecting the blackbirds and starlings that roost in cattail marshes would significantly affect the abundance of this nutrient. This supports a conclusion that none of the BDM alternatives discussed herein would significantly alter the process of eutrophication in marsh roosting areas.

CHAPTER 3: ALTERNATIVES INCLUDING THE PROPOSED ACTION

3.1 ALTERNATIVES ANALYZED IN DETAIL

This EA will analyze four alternatives in detail in this EA:

- 1) **Alternative 1 - Continue the Current Federal BDM Program (No Action/Proposed Action).** This is the Proposed Action as described in Chapter 1 and is the No Action Alternative as defined by the Council on Environmental Quality (40 CFR 1500-1508) for analysis of ongoing programs or activities.
- 2) **Alternative 2 – Nonlethal BDM by WS-Kansas Only.** Under this alternative, WS would use only nonlethal methods in BDM. WS-Kansas could still recommend the use of lethal methods, but would not partake in implementing them.
- 3) **Alternative 3 – WS-Kansas Provides Technical Assistance Only for BDM.** Under this alternative, WS-Kansas would not conduct any direct operational BDM activities in Kansas. If requested, WS-Kansas would provide affected resource owners with technical assistance information only.
- 4) **Alternative 4 - No Federal WS-Kansas BDM.** This alternative consists of no federal BDM program by WS-Kansas or other federal agency.

3.2 DESCRIPTION OF THE ALTERNATIVES

3.2.1 Alternative 1 – Continue the Current Federal BDM Program

The No Action Alternative is a procedural NEPA requirement (40 CFR 1502), is a viable and reasonable alternative that could be selected, and serves as a baseline for comparison with the other alternatives. The No Action Alternative, as defined here, is consistent with Council on Environmental Quality's definition. The proposed action is to continue the current portion of WS-Kansas that responds to requests for BDM to protect human health and safety, agricultural and natural resources, and property as discussed in Section 1.3, and conduct surveillance projects involving birds as needed. A major component of the current program is the protection of human health and safety and property from wildlife strikes to aircraft. The BDM program would also operate to reduce or minimize the loss of livestock feed and the risk of bird-related livestock health problems presented by starlings and blackbirds at requesting dairies and feedlots, and to meet requests to minimize bird damage or the risk of damage to all other resources. To meet these goals, WS-Kansas would have the objective of responding to all requests for assistance with, at a minimum, technical assistance or self-help advice, or, where appropriate and when cooperative or congressional funding is available, direct damage management assistance in which professional WS-Kansas personnel conduct BDM. An IWDM approach would be implemented which would allow use of any legal technique or method, used singly or in combination, to meet requestor needs for resolving conflicts with birds. Agricultural producers and others requesting assistance would be provided with information regarding the use of effective nonlethal and lethal techniques. Lethal methods used by WS-Kansas would include shooting, trapping, egg addling/destruction, DRC- 1339, Avitrol®, or euthanasia following live capture by trapping, hand capture, nets.). Nonlethal methods used by WS-Kansas may include porcupine wire deterrents, wire barriers and deterrents, chemical repellents (e.g., methyl anthranilate, polybutene tactile repellents, etc.), and harassment. In many situations, the implementation

of nonlethal methods such as exclusion-type barriers would be the responsibility of the requestor to implement which means that, in those situations, WS-Kansas only function would be to implement lethal methods, if any were determined to be necessary to resolve a damage problem. BDM by WS-Kansas would be allowed in the State, when requested, on private property sites, public facilities or other locations where a need has been documented, upon completion of an WID. All management actions would comply with appropriate federal, state, and local laws.

3.2.2 Alternative 2 - Nonlethal BDM by WS-Kansas Only

This alternative would require WS-Kansas to use only nonlethal methods to resolve bird damage problems. Persons receiving technical assistance could still resort to lethal methods that were available to them. DRC-1339 and A-C are currently only available for use by WS-Kansas employees and could not be used by private individuals. Section 3.3.1.3 describes nonlethal methods available for use by WS-Kansas under this alternative and the lethal techniques that could be used by State agency personnel and private individuals.

3.2.3 Alternative 3 - WS-Kansas Provides Technical Assistance Only for BDM

This alternative would not allow for WS-Kansas operational BDM in Kansas. WS-Kansas would only provide technical assistance and make recommendations when requested. Producers, property owners, State and local agency personnel, or others could conduct BDM using traps, shooting, Avitrol[®], or any nonlethal method that is legal. Avitrol[®] could only be used by State certified pesticide applicators. Currently, DRC-1339 and A-C are only available for use by WS-Kansas employees and could not be used by private individuals. Section 3.3.1.3 describes BDM methods that could be employed by private individuals or other agencies after receiving technical assistance advice under this alternative.

3.2.4 Alternative 4 - No Federal WS-Kansas BDM

This alternative would eliminate federal involvement in BDM in Kansas. WS-Kansas would not provide direct operational or technical assistance and requestors of WS-Kansas services would have to conduct their own BDM without WS-Kansas input. Section 3.3.1.3 describes BDM methods that could be employed by private individuals or other agencies under this alternative, except that DRC-1339 would not be available for use. Avitrol[®] could be used by State certified restricted-use pesticide applicators. Information on future developments in nonlethal and lethal management techniques that culminate from NWRC would also not be available to producers or resource owners.

3.3 BDM STRATEGIES AVAILABLE TO WS-Kansas UNDER THE ALTERNATIVES

The strategies and methodologies described below include those that could be used or recommended under Alternatives 1, 2 and 3 described above. Alternative 4 would eliminate both WS-Kansas technical assistance and operational BDM by WS-Kansas.

3.3.1 Alternative 1 – Continue the Current Federal BDM Program

WS-Kansas currently uses many of the BDM methods available for use. Some BDM methods are widely used, while others are used infrequently. WS-Kansas recommends the use of many BDM methods for technical assistance to the public. The BDM methods available for use are described in Section 3.1.3.3.

The most effective approach to resolving wildlife damage is through IWDM, the integration of one or more damage management methods, used alone, simultaneously, or sequentially, to achieve the desired effect. The philosophy behind IWDM is to implement the best combination of effective management methods in a cost-effective manner while minimizing the potentially harmful effects on humans, target and nontarget species, and the environment. IWDM may incorporate cultural practices (i.e., animal husbandry), habitat modification (i.e., exclusion), animal behavior modification (i.e., scaring), removal of and individual offending animal, local population reduction, or any combination of these, depending on the circumstances of the specific damage problem. IWDM is being implemented by WS-Kansas under the current BDM program.

3.3.1.1 The IWDM Strategies That WS-Kansas Employs.

Technical Assistance Recommendations

“Technical assistance” as used herein is information, demonstrations, and advice on available and appropriate WDM methods. The implementation of damage management actions is the responsibility of the requestor. In some cases, WS-Kansas provides supplies or materials that are of limited availability for non-WS-Kansas entities to use. Technical assistance may be provided following a personal or telephone consultation, or during an on-site visit with the requestor. Generally, several management strategies are described to the requestor for short and long-term solutions to damage problems; these strategies are based on the level of risk, need, and the practicality of their application.

Under APHIS NEPA Implementing regulations and specific guidance for the WS program, WS technical assistance is categorically excluded from the need to prepare an EA or EIS. However, it is discussed in this EA because it is an important component of the IWDM approach to resolving bird damage problems.

Direct Damage Management Assistance

This is the conduct or supervision of damage management activities by WS-Kansas personnel. Direct damage management assistance may be initiated when the problem cannot effectively be resolved through technical assistance alone, and when *Agreements for Control* or other comparable instruments provide for WS-Kansas direct damage management. The initial investigation defines the nature, history, extent of the problem, species responsible for the damage, and methods that would be available to resolve the problem. Professional skills of WS-Kansas personnel are often required to effectively resolve problems, especially if restricted use pesticides are necessary, or if the problem is complex. WS-Kansas direct BDM assistance involves the implementation of lethal control or nonlethal capture or harassment methods.

3.3.1.2 WS-Kansas Decision Making.

WS-Kansas personnel are frequently contacted after requestors have tried or considered both nonlethal and lethal methods and found them to be ineffective for any number of reasons. Misapplied or inappropriate methods are often impractical, too costly, time consuming or inadequate for reducing damage to an acceptable level. WS-Kansas personnel assess the problem, evaluate the appropriateness and availability (legal and administrative) of strategies and methods based on biological, economic and social considerations. Following this evaluation, the methods deemed practical for the situation are

developed into a management strategy. After the management strategy has been implemented, monitoring is conducted and evaluation continues to assess the effectiveness of the strategy. This conscience thought process for evaluating and responding to damage complaints is the WS Decision Model (WS-Directive 2.201). In the model, most damage management efforts consist of continuous feedback between receiving the request and monitoring the results of the damage management strategy. The Decision Model is not a documented process, but a mental problem-solving process common to most, if not all, professions. As depicted in the Decision Model, consideration is given to the following factors before selecting or recommending control methods and techniques:

- Species responsible for damage
- Magnitude, geographic extent, frequency, and duration of the problem
- Status of target and nontarget species, including T&E species
- Local environmental conditions
- Potential biological, physical, economic, and social impacts
- Potential legal restrictions
- Costs of control options
- Prevention of future damage (lethal and nonlethal techniques)

Examples are given for the two most common problem species that WS-Kansas conducts BDM illustrating the WS Decision Making process.

European Starling Problems

During the fall and winter months in Kansas, starlings congregate at many livestock and dairy operations. Operators become concerned not only with the consumption of the cattle feed, but also with potential contamination of the feed itself and the associated disease risks. WS-Kansas responds directly to requests each year where large numbers of starlings are causing damage. WS-Kansas generally uses technical assistance initially, recommending noise harassment strategies such as propane cannons, pyrotechnics, and harassment shooting. Where these methods become ineffective, WS-Kansas may use the avicide DRC-1339. Shooting, as well as capturing and euthanizing starlings, are also examples of lethal methods that WS-Kansas simultaneously integrates along with nonlethal strategies.

Feral Domestic Pigeon Problems

Feral domestic pigeons are responsible for many nuisance bird damage requests for assistance in Kansas. The most common situation with this species involves pigeons roosting and nesting on buildings and structures in both urban and rural areas. The main nuisance problem is from the droppings which are most frequently addressed by recommending exclusion devices/barriers (such as netting, hardware cloth, screen, porcupine wire) or habitat modification and local population reduction. With feral pigeons, the population using a structure typically must be removed before exclusion and other techniques will work effectively because the resident population will remain at the site and continue to cause damage. Methods that could be used for population reduction include shooting with pellet rifles, low-velocity .22 caliber rifle rounds, shotguns (mostly in rural or semi-rural situations), live capture with cage traps followed by euthanasia, DRC-1339 baiting, or Avitrol®. Once the population using a particular site is removed, clean up of droppings and feathers (an attractant to new pigeons), and exclusion techniques or building modifications, especially from nesting sites (new pigeons looking for nesting sites are less likely to take up residence) are effective in minimizing the potential for a problem to recur. WS-Kansas has been requested in recent years to reduce local pigeon numbers in several cities and facilities around the state. WS-Kansas expects to receive future requests from all across Kansas and could respond with technical assistance, direct operational control, or a combination of both in any situation Statewide.

3.3.1.3 BDM Methods Available for Use.

WS has been conducting WDM in the United States for more than 85 years. WS has modified WDM activities to reflect societal values and minimize impacts to people, wildlife, and the environment. The efforts have involved research and development of new field methods and the implementation of effective strategies to resolve wildlife damage. WS-Kansas personnel use a wide range of methods in BDM and strategies are based on applied IWDM principles. Some techniques suggested for use by resource owners, by other entities or individuals, to stop bird damage may not be considered by WS-Kansas if they are biologically unsound, legally questionable, or ineffective.

Resource Management

Resource management includes a variety of practices that may be used by agriculture producers and other resource owners to reduce their exposure to potential wildlife depredation losses. Implementation of these practices is appropriate when the potential for depredation can be reduced without significantly increasing the cost of production or diminishing the resource owner's ability to achieve land management and production goals. Changes in resource management are usually not conducted operationally by WS-Kansas, but WS-Kansas could assist producers in implementing changes to reduce problems.

Animal Husbandry. This category includes modifications in the level of care and attention given to livestock, shifts in the timing of breeding and births, selection of less vulnerable livestock species to be produced, and the introduction of human custodians to protect livestock. The level of attention given to livestock may range from daily to seasonally. Generally, when the frequency and intensity of livestock handling increases, so does the degree of protection. The use of human custodians, such as sheep herders, can significantly reduce damage levels, but can be very costly.

The risk of predation to poultry and small livestock, primarily newborns, can be reduced when operations monitor their livestock during the hours when predatory birds are most active. The risk of predation is usually greatest with immature livestock, and this risk can be reduced by holding pregnant females in pens or sheds to protect newborn livestock and keeping newborn livestock in pens for their first 2 weeks. The risk of predation to livestock diminishes with age and the increase in size. For example, black and turkey vultures and raven kill calves within a short time after they are born and keeping cows gathered during calving can reduce the opportunity for this, if custodians are present to scare away the birds. Shifts in breeding schedules can also reduce the risk of predation by altering the timing of births to coincide with the greatest availability of natural food items for predators or to avoid seasonal concentrations of migrating predators such as ravens and vultures.

Altering animal husbandry to reduce wildlife damage has many limitations though. Gathering may not be possible where livestock are in many fenced pastures and where grazing conditions require livestock to scatter. Hiring extra herders, building secure holding pens, and adjusting the timing of births is usually expensive. The timing of births may be related to weather or seasonal marketing of livestock. The expense associated with a change in husbandry practice may exceed the savings. WS-Kansas encourages resource owners to use these strategies where they may be beneficial, but does not conduct these techniques operationally.

Crop Selection/Scheduling. In areas where damage to crops from wildlife is expected, different crops can be planted that are less attractive to the wildlife causing damage, or crops can be planted at an earlier or later date to avoid damage. This practice depends on the species causing damage (e.g., resident vs. migrant), the availability of alternate food sources, and the market for alternative crops. In addition, research has been conducted on damage resistant crop varieties, but with little success.

Lure Crops. When depredations cannot be avoided by careful crop selection or modified planting schedules, lure crops can sometimes be used to mitigate the potential loss (Cummings et al. 1987). Lure crops are planted or left for consumption by wildlife as an alternate food source. To improve the efficacy of this technique, it is recommended that frightening devices be used in nearby non-lure crop fields and that the wildlife should not be disturbed in the “lure crop fields.” This approach provides relief for critical crops by sacrificing less important or specifically planted fields. Establishing lure crops is sometimes expensive, requires considerable time and planning to implement, and may attract other unwanted species to the area.

Habitat Management. Localized habitat management is often an integral part of WDM. WS-Kansas often recommends habitat modifications to reduce the attractiveness of an area to species that may cause damage to resources. The type, quality, and quantity of habitat are directly related to the wildlife produced or attracted to an area. Habitat can be managed to not produce or attract certain wildlife species. For example, vegetation can be planted that is unpalatable to certain wildlife species or trees and shrubs can be pruned or cleared (Figure 5) to make an area unattractive. Ponds or other water sources can be eliminated to reduce certain wildlife species. Habitat management is typically aimed at eliminating nesting, roosting, loafing, or feeding sites used by particular species. Limitations of habitat management as a method of reducing wildlife damage are determined by the characteristics of the species involved, the nature of the damage, economic feasibility, and other factors. Legal constraints may also exist which preclude altering particular habitats. Most habitat management recommended by WS-Kansas is aimed at reducing wildlife aircraft strike hazards at airports, eliminating bird winter roosts, or managing field rodent populations at airports so not to attract raptors.

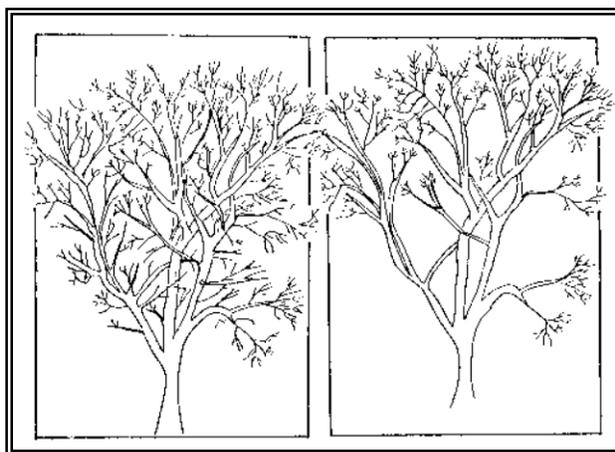


Figure 5. Tree pruning to reduce attractiveness to birds.

Change in the architectural design of a building or a public space can often help to avoid potential wildlife damage. For example, selecting species of trees and shrubs that are not attractive to wildlife can reduce the likelihood of potential wildlife damage to parks, public spaces, or residential areas. Similarly, incorporating spaces or open areas into landscape designs that expose wildlife can significantly reduce potential problems. Modifying public spaces to remove the potential for wildlife conflicts is often impractical because of economics or the presence of other nearby habitat features that attract wildlife. Some forms of habitat management may also be incompatible with the aesthetic or recreational features of the site.

Birds use trees and poles for roosting, perching and nesting, and the removal or modification of these items will often reduce the attractiveness of the area. Large winter bird roosts can be greatly reduced at roost sites by removing all the trees or selectively thinning the stand. Roosts often will re-form at traditional sites, and substantial habitat alteration is the only way to permanently stop such activity. Poles can also be used to attract raptors to sites where reductions in rodent populations are desired.

Habitat management does have the potential to have an effect on all T&E species if present in an area, especially where a T&E species is present that uses the habitat to be modified. If WS-Kansas determines habitat management would be appropriate to reduce wildlife damage or the threat of damage at a site,

such as an airport where wetlands often should be removed, WS-Kansas will ensure that the cooperator is aware for the need to address T&E species impacts. Habitat management recommendations by WS-Kansas are typically up to the cooperator or land management agency to implement.

Glyphosate, such as Glypro[®] Specialty Herbicide and AguaNeat[®] Aquatic Herbicide, is used by WS to reduce cattail (*Typhus spp.*) choked marshes in the Dakotas that are used by blackbirds for roosts and nesting habitat. Glyphosate treatments are conducted to reduce the density of cattails from a wetland for a period of 3-5 years, depending on weather conditions (i.e., moisture levels). Invasive nonnative and hybrid cattail stands have recently invaded the wetlands of the Plains and are a comparatively new habitat type which has changed the species composition of the area to some degree. The marshes, where they are present, easily become inundated with the hybrid cattails and the stands become dense or “choked” with cattails (i.e., little open water exists). A few species of wildlife favor this habitat type, especially for cover, while others, do not such as waterfowl and those that become more vulnerable to predation. Toxicity studies have shown that the glyphosate is non-toxic to all wildlife and safe for use. It is commonly used on many of the National Wildlife Refuges where marsh habitat becomes choked and makes waterfowl habitat relatively unavailable. Although this method is not currently used by WS-Kansas, it could be, especially to disperse blackbird roosts near sunflower or other crop fields in the late summer and early fall.

Modification of Human Behavior. WS-Kansas often tries to alter human behavior to resolve potential conflicts between humans and wildlife. For example, WS-Kansas may talk with residents of an area to eliminate the feeding of wildlife that occurs in parks, recreational sites, or residential areas to reduce damage by certain species of wildlife, such as coyotes, geese, and bears. This includes inadvertent feeding allowed by improper disposal of garbage or leaving pet food outdoors where wildlife can feed on it. Many wildlife species adapt well to human settlements and activities, but their proximity to humans may result in damage to structures or threats to public health and safety. Eliminating wildlife feeding and handling can reduce potential problems, but many people who are not directly affected by problems caused by wildlife enjoy wild animals and engage in activities that encourage their presence. It is difficult to consistently enforce no-feeding regulations and to effectively educate all people concerning the potential liabilities of feeding wildlife.

Physical Exclusion

Physical exclusion methods restrict the access of birds to resources. These methods can provide effective prevention of bird damage in many situations. Bird proof barriers can be effective but are often cost-prohibitive, particularly because of the aerial mobility of birds which requires overhead barriers as well as peripheral fencing or netting. Exclusion adequate to stop bird movements can also restrict movements of livestock, people and other wildlife (Fuller-Perrine and Tobin 1993). Most exclusionary devices are often more costly than the value of the resource being protected, especially for large areas, and, therefore, are uneconomical. In addition, some exclusionary devices are labor intensive which can further reduce their cost-effectiveness. Exclusionary devices can also cause potential injure, maim and kill nontarget wildlife, particularly birds. Netting can entangle birds and needs to be checked frequently to release birds that have been trapped. Wire grids can inadvertently injure or kill nontarget wildlife species, including T&E species, from impact at high speeds.

Fencing. Fences are widely used to prevent damage from wildlife. Exclusionary fences constructed of woven wire or multiple strands of electrified wire can be effective in keeping wading birds from some areas such as an aquaculture facility or molting Canada Geese out of crop fields. The size of the wire grid must be small enough and the height of the fence high enough to keep the birds from entering the effected area. For ponds, fencing at least 3 feet high should be erected in water 2 to 3 feet deep. If fences are built

in shallow water, birds can easily feed on the pond side of the fence. Raceway fences should be high enough to prevent feeding from the wall. Occasionally, blackbirds will cling to fencing or screening near the water and feed on small fish. A slippery surface created by draping plastic over the fence or screen can be used to eliminate this problem. Electric fences or wires have also been used with limited success. This type of exclusion can make routine work around ponds and hatcheries difficult or impossible. However, fencing does have limitations. Even an electrified fence is not always bird-proof and the expense of the fencing can often exceed the benefit. In addition, if large areas are fenced, the wildlife being excluded has to be removed from the enclosed area to make it useful.

Overhead Barriers. Overhead barriers such as netting and wire grids are mostly used to prevent access to areas such as gardens, fish ponds, dwellings, and livestock and poultry pens. Selection of a barrier system depends on the bird species being excluded, expected duration of damage, size of the area or facility to be excluded, compatibility of the barrier with other operations (e.g., feeding, cleaning, harvesting, etc.), possible damage from severe weather, and the effect of on-site aesthetics. The barrier system also depends on the resource being protected and its value. Overhead barrier systems can initially be very costly and expensive to maintain.

Netting consists of placing plastic or wire nets around or over resources in a small area, likely to be damaged or that have a high value. Netting is typically used to protect areas such as livestock pens, fish ponds and raceways, and high value crops. Complete enclosure of ponds and raceways to exclude all fish-eating birds requires 1.5- to 2-inch mesh netting secured to frames or supported by overhead wires (Figure 6). Gates and other openings must also be covered. Some hatchery operators use mesh panels placed directly on raceways to effectively exclude predatory birds. Small mesh netting or wire with less than 1-inch openings, secured to wood or pipe frames, prevents feeding through the panels.

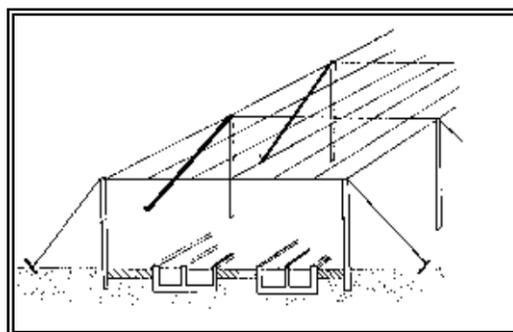


Figure 6. Overhead wire grid to exclude birds.

Because the panels may interfere with feeding, cleaning, or harvesting, they are most appropriate for seasonal or temporary protection. It is also used to prevent wildlife access to settling ponds that contain poisons which could kill them. Small mesh can also be used in ponds to prevent fish from entering shallow water where they would be easy prey for wading birds. Complete enclosure of areas with netting can be very effective at reducing damage by excluding all problem species, but can be costly.

Ponds, raceways, buildings, and other areas can be protected with overhead wires or braided or monofilament lines suspended horizontally in one direction or in a crossing pattern. Monofilament wires can effectively deter gull use of specific areas where they are causing a nuisance (Blokpoel 1976, Blokpoel and Tessier 1984, Belant and Ickes 1996). The birds apparently fear colliding with the wires and thus avoid flying into areas where the method has been employed. The WS program in Washington has effectively utilized steel wires to deter gulls from preying on salmon fingerlings at the base of dams. Spacing between wires or lines should be based on the species and habits of the birds causing damage. Where the wire grids need to be suspended up high to allow for maintenance, perimeter fencing or wire around ponds and raceways provides some protection from wading birds and is most effective for herons. Partial enclosures, such as overhead lines, cost less but may not exclude all bird species such as terns. Additionally, some areas in need of protection are too large to be protected with netting or overhead wires.

Other Exclusionary Methods. Entrance barricades of various kinds are used to exclude several bird species such as starlings, pigeons, and house sparrows from dwellings, storage areas, gardens, or other areas. Heavy plastic strips hung vertically in open doorways (Figure 7) have been successful in some situations in excluding birds from buildings used for indoor feeding or housing of livestock (Johnson and Glahn 1994). Plastic strips, however, can prevent or substantially hinder the filling of feed troughs or feed platforms at livestock feeding facilities. Such strips can also be covered up when the feed is poured into the trough by the feed truck. They are not practical for open-air feedlot operations that are not housed in buildings. Metal flashing or hardware cloth may be used to prevent entry of wildlife into buildings or roosting areas. Floating plastic balls called Euro-Matic Bird Balls™ have successfully been used at airports and settling ponds to keep birds from landing on ponds. Porcupine wire (Figure 8) such as Nixalite™ and Catclaw™ is a mechanical repellent method that can be used to exclude pigeons and other birds from ledges and other roosting surfaces (Williams and Corrigan 1994). The sharp points inflict temporary discomfort on the birds as they try to land which deters them from roosting. Drawbacks of this method are that some pigeons have been known to build nests on top of porcupine wires, and the method can be expensive to implement if large areas are involved. Electric shock bird control systems are available from commercial sources and, although expensive, can be effective in deterring pigeons and other birds from roosting on ledges, window sills and other similar portions of structures (Williams and Corrigan 1994). There are many more examples of these types of exclusionary devices to keep wildlife from entering or landing on areas where they are unwanted.

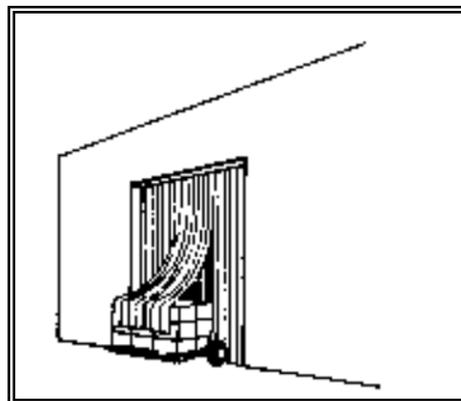


Figure 7. Entrance barricade to deter birds.

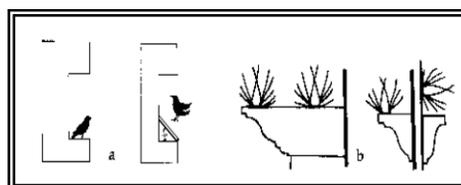


Figure 8. Porcupine wire on ledge to deter birds.

Wildlife Management

Reducing wildlife damage through wildlife management is achieved using a myriad of techniques. The objective of this approach is to alter the behavior of or repel the target species, remove specific individuals from the population, reduce local population densities, or suppress/extirpate exotic species populations to eliminate or reduce the potential for loss or damage to property and natural resources.

Frightening Devices. Frightening devices are used to repel wildlife from an area where they are a damage risk (i.e., airport, crops) or at risk of being contaminated (e.g., oil spill, settling ponds). The success of frightening methods depends on an animal's fear of, and subsequent aversion to, offensive stimuli (Shivak and Martin 2001). A persistent effort is usually required to effectively apply frightening techniques and the techniques must be sufficiently varied to prolong their effectiveness. Over time, animals often habituate to commonly used scare tactics and ignore them (Arhart 1972, Rossbach 1975, Pfeifer and Goos 1982, Conover 1982, Shirota et al. 1983, Schmidt and Johnson 1984, Mott 1985, Dolbeer et al. 1986, Graves and Andelt 1987, Tobin et al. 1988, Bomford 1990). In addition, in many cases birds frightened from one location become a problem at another. Scaring devices, for the most part, are directed at specific target species by specialists working in the field. However, several of these devices, such as scarecrows and propane exploders can be automated.

Harassment and other scaring devices and techniques to frighten birds are probably the oldest methods of combating wildlife damage. These devices may be either auditory or visual and generally only provide

short-term relief from damage. However, a number of sophisticated techniques have been developed to scare or harass birds from an area. The use of noise-making devices is the most popular and commonly used. Other methods include harassment with visual stimuli (e.g., scarecrows, human effigies, balloons, Mylar[®] tape, and wind socks), vehicles, lasers, people, falcons or dogs. These are used to frighten mammals or birds from the immediate vicinity of the damage prone area. As with other WDM efforts, these techniques tend to be more effective when used collectively in a varied regime rather than individually. However, the continued success of these methods frequently requires reinforcement by limited shooting (see Shooting). These techniques are generally only practical for small areas. Scaring devices such as distress calls, helium filled eye spot balloons, raptor effigies and silhouettes, mirrors, and moving disks can be effective but usually for only a short time before birds become accustomed and learn to ignore them (Schmidt and Johnson 1984, Bomford 1990, Rossbach 1975, Graves and Andelt 1987, Mott 1985, Shirota et al. 1983, Conover 1982, Arhart 1972). Finally, it must be noted that sound-scare devices can also scare livestock when they are used in their vicinity.

Visual scaring techniques such as use of Mylar[®] tape (highly reflective surface produces flashes of light that startles birds), eye-spot balloons (the large eyes supposedly give birds a visual cue that a large predator is present), flags, effigies (scarecrows), sometimes are effective in reducing bird damage. Mylar tape has produced mixed results in its effectiveness to frighten birds (Dolbeer et al. 1986, and Tobin et al. 1988). Birds quickly learn to ignore visual and other scaring devices if the birds' fear of the methods is not reinforced with shooting or other tactics.

Electronic distress sounds and alarm calls of various animals have been used singly and in conjunction with other scaring devices to successfully scare or harass animals. Many of these sounds are available on records and tapes. Distress calls are broadcast to the target animals from either fixed or mobile equipment in the immediate or surrounding area of the problem. Animals react differently to distress calls; their use depends on the species and the problem. Calls may be played for short (e.g., few second) bursts, for longer periods, or even continually, depending on the severity of damage and relative effectiveness of different treatment or "playing" times. Some artificially created sounds also repel wildlife in the same manner as recorded "natural" distress calls.

Propane exploders (Figure 9) operate on propane gas and are designed to produce loud explosions at controllable intervals. They are strategically located (i.e., elevated above the vegetation, if possible) in areas of high wildlife use to frighten wildlife from the problem site. Because animals are known to habituate to sounds, exploders must be moved frequently and used in conjunction with other scare devices. Exploders can be left in an area after dispersal is complete to discourage animals from returning.

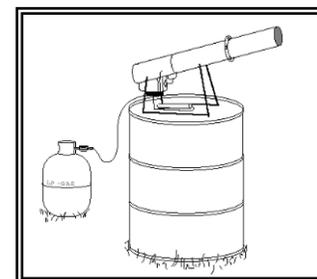


Figure 9. Propane exploder.

Pyrotechnics. Pest control pyrotechnics are an effective, non lethal wildlife damage management tool for dispersing birds when they threaten agriculture, property, or public safety or health. Although some risk of fire and bodily harm exists from the use of pyrotechnics and propane cannons, when used appropriately and in consideration of those risks, they can be used with a high degree of safety. KS WS will use, transport, and maintain pyrotechnics in accordance with WS Directive 2.625. Pyrotechnics will only be used by employees wearing appropriate personal protective equipment, i.e., hearing and eye protection as identified in the State/NWRC Field Station or District program's job hazard assessment for pyrotechnic use (APHIS Safety and Health Manual 2004).

Lights, such as strobe, barricade, and revolving units, are used with mixed results to frighten waterfowl. Brilliant lights, similar to those used on aircraft, are most effective in frightening

night-feeding birds. These extremely bright-flashing lights have a blinding effect, causing confusion that reduces the bird's ability to see. Flashing amber barricade lights, like those used at construction sites, and revolving or moving lights may also frighten birds when these units are placed on raceway walls, fish pond banks, or ingress corridors. However, most birds rapidly become accustomed to such lights and their long-term effectiveness is questionable. In general, the type of light, the number of units, and their location are determined by the size of the area to be protected and by the power source available.

Lasers are a relatively new technique used to frighten and disperse birds from their roosts. Although the use of a laser (the term of "laser" is an acronym for Light Amplification by Stimulated Emission of Radiation) to alter bird behavior was first introduced nearly 30 years ago (Lustick 1973). The laser received very little attention, until recently, when it had been tested by NWRC. Results have shown that several bird species, such as Double-crested Cormorants, Canada Geese, other waterfowl, gulls, vultures, and American Crows have all exhibited avoidance of laser beams during field trials (Glahn et al. 2001, Blackwell et al. 2002). The repellent or dispersal effect of a laser is due to the intense and coherent mono-wavelength light that, when targeted at birds, can have substantial effects on behavior and may illicit changes in physiological processes (APHIS 2001). Best results are achieved under low-light conditions (i.e., sunset through dawn) and by targeting structures or trees in proximity to roosting birds, thereby reflecting the beam. In field situations, habituation to lasers has not been observed (APHIS 2001). Lasers are directional by the user and, therefore, will have little effect on nontarget species.

Water spray devices from rotating sprinklers placed at strategic locations in or around ponds or raceways will repel certain birds. However, individual animals may become accustomed to the spray and feed among the sprinklers. Best results are obtained when high water pressure is used and the sprinklers are operated with an on-off cycle. The sudden startup noise also helps frighten birds from an area.

Physical harassment with radio controlled airplanes is effective in several situations for dispersing damage-causing birds. This tool is effective in removing raptors from areas that are not accessible by other means. Radio controlled airplanes allow for up close and personal harassment of birds, while combining visual (e.g., eyespots painted on the wings) and auditory (e.g., engine noise and whistles attached to the aircraft) scare devices. Disadvantages of method are birds in large flocks do not respond well to the plane, training is required to become efficient, a good working relationship is required by the operator and air traffic controllers, weather conditions may restrict the usefulness of the plane, and the planes require frequent mechanical up-keep.

Avitrol®, 4-Aminopyridine, is primarily used as a chemical frightening agent (repellent) for blackbirds in corn and sunflower fields and can be effective in a single dose when mixed with untreated baits. However, Avitrol® is not completely a frightening agent because most birds that consume the bait die (Johnson and Glahn 1994). Avitrol® comes preformulated with treated baits mixed with untreated baits (1:99) and applied to crop fields for birds to ingest. After ingesting the bait, the bird becomes ill, flies erratically, emits distress calls, and typically dies. This behavior is intended to frighten the remaining blackbirds from the treated fields. NWRC research and producers have had mixed and inconsistent results with the technique's effectiveness. As a result, this formulation of Avitrol® has not been used widely. Avitrol® is more often used as a toxicant for other species of birds such as pigeons and it will be discussed further under chemical toxicants. Avitrol® is a restricted-use pesticide that can only be sold to certified applicators. It is available in several bait formulations where only a small portion of the individual grains carry the

chemical. It can be used during anytime of the year, but is used most often during winter and spring. Any granivorous bird associated with the target species could be affected by Avitrol®. Avitrol® is water soluble, but laboratory studies demonstrated that Avitrol® is strongly absorbed onto soil colloids and has moderately low mobility. Biodegradation is expected to be slow in soil and water, with a half-life ranging from three to 22 months. However, Avitrol® may form covalent bonds with humic materials, which may serve to reduce its bioavailability in aqueous media, is non-accumulative in tissues, and is rapidly metabolized by many species (Schafer 1991). Avitrol® is acutely toxic to avian and mammalian species; however, blackbirds are more sensitive to the chemical and there is little evidence of chronic toxicity. Laboratory studies with predator and scavenger species have shown minimal potential for secondary poisoning, and during field use only magpies and crows appeared to have been affected (Schafer 1991). However, a laboratory study by Schafer et al. (1974) showed that magpies exposed to two to 3.2 times the published LD₅₀ (Lethal Dose required to kill 50% of the test subjects of a given species) in contaminated prey for 20 days were not adversely affected and three American kestrels were fed contaminated blackbirds for seven to 45 days were not adversely affected. Therefore, no probable risk is expected, based on low concentrations and low hazards quotient value for nontarget indicator species tested on this compound. No probable risk is expected for pets and the public, based on low concentrations and low hazards quotient value for nontarget indicator species tested on this compound.

Relocation. Translocation may be appropriate in some situations (i.e., if the problem species' population is at very low levels, there is a suitable relocation site, and the additional dollars required for relocation can be obtained.) However, those species that often cause damage problems (e.g., blackbirds, Canada Geese) are relatively abundant and relocation is not necessary for the maintenance of viable populations. Relocation may also result in future depredations if the relocated animal encounters protected resources again, and in some cases could require payment of damage compensation claims. Any decisions on relocation of wildlife are coordinated with State game and fish agencies and, in many instances, State laws require consultation with appropriate land management agencies/manager before relocating wildlife to these lands.

The American Veterinary Medical Association, The National Association of State Public Health Veterinarians, and the Council of State and Territorial Epidemiologists all oppose the relocation of mammals because of the risk of disease transmission (Centers for Disease Control 1990). Although relocation is not necessarily precluded in all cases, it would in many cases be logistically impractical and biologically unwise. Relocation of damaging birds to other areas following live capture generally would not be effective or cost-effective. Relocation to other areas following live capture would not generally be effective because problem bird species are highly mobile and can easily return to damage sites from long distances, habitats in other areas are generally already occupied, and relocation would most likely result in bird damage problems at the new location. Relocation of wildlife is also discouraged by WS policy (WS Directive 2.501) because of stress to the relocated animal, poor survival rates, and difficulties in adapting to new locations or habitats. However, there may be exceptions for relocating certain bird species. Relocation of damaging birds might be a viable solution and acceptable to the public when the birds were considered to have high value such as migratory waterfowl, raptors, or T&E species. In these cases, WS-Kansas would consult with the USFWS or KDWP to coordinate capture, transportation, and selection of suitable relocation sites.

Chemical Repellents. Chemical repellents are nonlethal chemical formulations used to discourage or disrupt particular behaviors of wildlife. There are three main types of chemical repellents: olfactory, taste, and tactile. Olfactory repellents must be inhaled to be effective. These are normally liquids, gases or granules, and require application to areas or surfaces needing protecting. Taste repellents are compounds (i.e., liquids, dusts, granules) that are normally applied to trees, shrubs and other materials that are likely

to be ingested or gnawed by the target species. Tactile repellents are normally thick, liquid-based substances which are applied to areas or surfaces to discourage travel of wildlife by irritating the feet or making the area undesirable for travel. Most repellents are ineffective or are short-lived in reducing or eliminating damage caused by wildlife, therefore, are not used very often by WS-Kansas.

Chemical repellents, as used by WS-Kansas, are compounds that prevent the consumption of crops, other food items, or use of an area by wildlife. They operate by producing an undesirable taste, odor, feel, or behavior pattern. Effective and practical chemical repellents should be nonhazardous to wildlife; nontoxic to plants, seeds, and humans; resistant to weathering; easily applied; reasonably priced; and capable of providing good repellent qualities. The reaction of different animals to a single chemical formulation varies and this variation in repellency may be different from one habitat to the next. Development of chemical repellents is expensive and cost prohibitive in many situations. Chemical repellents are strictly regulated, and suitable repellents are not available for many wildlife species or wildlife damage situations. Chemical repellents are commercially available for birds and include active ingredients such as methyl anthranilate which is grape soda flavoring (i.e., Rejex-it[®]), anthraquinone (Flight Control[®]) methiocarb (i.e., Mesurof[®]), or polybutenes (i.e., Tanglefoot[®]). These compounds are relatively nontoxic to the environment with the amount of active ingredient used in the different formulations, especially following label instructions. Many of the active ingredients in repellents are listed on the EPA's 25b exempt list, and have reduced registration requirements because of their relatively low risk to the environment. Most of the above repellents have labels with, at most, a "Caution" statement and can be purchased by the public. An exception is methiocarb which is discussed below. Applied in accordance with label directions, none of the other repellents discussed are expected to have an effect on nontarget species.

Methyl anthranilate (artificial grape flavoring used in foods and soft drinks for human consumption) could be used or recommended by WS-Kansas as a bird repellent. Methyl anthranilate (MA) (artificial grape flavoring food additive) has been shown to be an effective repellent for many bird species, including waterfowl (Dolbeer et al. 1993). It is registered under the brand name RejexIt[®] for applications to turf or to surface water areas used by unwanted birds. The material has been shown to be nontoxic to bees ($LD_{50} > 25$ micrograms/bee¹), nontoxic to rats in an inhalation study ($LC_{50} > 2.8$ mg/L²), and of relatively low toxicity to fish and other invertebrates. MA is a naturally occurring chemical in concord grapes and the blossoms of several species of flowers which is used as a food additive and perfume ingredient (Dolbeer et al. 1992). It has been listed as "Generally Recognized as Safe" by the FDA (Dolbeer et al. 1992). Water surface and turf applications of MA are generally considered expensive. For example, the least intensive application rate required by label directions is 20 lbs. of product (8 lbs. active ingredient) per acre of surface water at a cost of about \$64/lb. with retreating required every 3-4 weeks; a golf course in Rio Rancho, New Mexico estimated that treating four watercourse areas would cost in excess of \$25,000 per treatment for material alone. MA completely degrades in about 3 days when applied to water which indicates the repellent effect is short-lived. Cost of treating turf areas would be similar on a per acre basis.

Another potentially more cost effective method of MA application is by use of a fog-producing machine (Vogt 1997). The fog drifts over the area to be treated and is irritating to the birds while

¹An LD_{50} is the dosage in milligrams of material per kilogram of body weight, or, in this case in micrograms per individual bee, required to cause death in 50% of a test population of a species.

²An LC_{50} is the dosage in milligrams of material per liter of air required to cause death in 50% of a test population of a species through inhalation.

being nonirritating to any humans that might be exposed. Fogging applications must generally be repeated 3-5 times after the initial treatment before the birds abandon a treatment site. Applied at a rate of about .25 lb./ acre of water surface, the cost is considerably less than when using the turf or water treatment methods. However, the fogging method is currently not registered for use in New Mexico and therefore cannot legally be used to meet the goals of the proposed action.

Methiocarb is a chemical repellent used for nonlethal taste aversion and was first registered as a molluscicide, but found to have avian repellent properties. Mesurol[®], the trade name, is registered by the EPA (EPA Reg. No. 56228-33) as an aversive-conditioning egg treatment to reduce predation from common ravens, white-necked ravens, and American crows on the eggs of T&E species or other wildlife species determined to be in need of special protection. Mesurol[®] is registered for WS use only. The active ingredient is methiocarb which is a carbamate pesticide which acts as a cholinesterase inhibitor. Species which feed upon treated eggs may show signs of toxicity (e.g., regurgitation, lethargy, or temporary immobilization). Occasionally, birds may die after feeding upon treated eggs, but most birds exposed to treated eggs survive. Avery et al. (1995) examined the potential of using eggs injected with 30mg of methiocarb to condition common ravens from preying on eggs of endangered California least terns. Results showed that proper deployment of treated eggs can be a useful, nonlethal method for reducing raven predation at least tern colonies. Avery and Decker (1994) evaluated whether predation might be reduced through food avoidance learning. They used captive fish crows to examine avoidance response from methiocarb (18mg/egg) and methyl anthranilate (100mg/egg). Their study showed that some crows displayed persistence to the 5-day exposure and that successful application may require an extended period of training for target predators to acquire an avoidance response. During the spring of 2001, WS conducted a field test on the Sterling Wildlife Management Area in Bingham County, Idaho, where Mesurol[®] treated eggs were exposed to black-billed magpies to evaluate aversive conditioning to eggs of waterfowl and upland game birds. The number of magpies feeding on treated eggs decreased after a period. However, their feeding behavior switched to pecking holes in eggs, possibly trying to detect treated eggs before consuming them. This behavior may suggest that at least some magpies experienced the ill effects of Mesurol[®], but the "tasting" of eggs may result in increased predation (Maycock and Graves 2001).

Capture or Take Methods. Several methods are available to capture or take offending animals. The appropriateness and efficacy of any technique will depend on a variety of factors. Capture and take methods are employed per USDA, APHIS, Wildlife Services Risk Assessment 2018.

Leghold traps are versatile and widely used by WS-Kansas for capturing many species. These traps can be utilized to live-capture a variety of animals but are most often used by WS-Kansas to capture mammals. Birds are rarely targeted with foot hold traps, except padded jaw foot hold pole traps (discussed below). Traps are effectively used in both terrestrial and shallow aquatic environments. Traps placed in the travel lanes of the targeted animal, using location to determine trap placement rather than attractants, are known as "*blind sets*." Three advantages of the leghold trap are: 1) they can be set under a wide variety of conditions, 2) nontarget captures can be released or relocated, and 3) pan-tension devices can be used to reduce the probability of capturing smaller nontarget animals (Turkowski et al. 1984, Phillips and Gruver 1996). Disadvantages of using leghold traps include the difficulty of keeping them in operation during rain, snow, or freezing weather. Additionally, they lack selectivity where nontarget species are of a similar or heavier weight as the target species. The use of foot hold traps also requires more time and labor than some methods, but they are indispensable in resolving many depredation problems.

Cage traps come in a variety of styles for WDM to target different species. The most commonly known cage traps used in the current program are box traps. Box traps are usually rectangular, made from wood or heavy gauge wire mesh. These traps are used to capture animals alive and can often be used where many lethal or more dangerous tools would be too hazardous. Box traps are well suited for use in residential areas.

Cage traps usually work best when baited with foods attractive to the target animal. They are used to capture birds ranging in size from sparrows to vultures. Cage traps do have a few drawbacks. Some individual target animals avoid cage traps. Some nontarget animals become “trap happy” and purposely get captured to eat the bait, making the trap unavailable to catch target animals. These behaviors can make a cage trap less effective. Cage traps must be checked frequently to ensure that captured animals are not subjected to extreme environmental conditions. For example, an animal may die quickly if the cage trap is placed in direct summertime sunlight. Another potential problem with the use of cage traps is that some animals will fight to escape and become injured. WS-Kansas standard procedure when conducting bird trapping operations is to ensure that an adequate supply of food and water is in the trap to sustain decoy and captured birds for several days. Active traps are checked regularly to replenish bait and water and to remove captured birds. Nontarget species are released during trap checks. USFWS BOs (USDA 2015) had no concerns with impacts to T&E species from the use of these traps.

Decoy traps, modeled after the Australian crow trap, are used to capture several species of birds, including crows, starlings, sparrows, gulls, and vultures. They are large screen enclosures with the access modified to suit the target species. A few live birds are maintained in the baited trap to attract birds of the same species and, as such, act as decoys. Non-target species are released unharmed.

Nest box traps are used for a variety of damage situations to capture birds (DeHaven and Guarino 1969, Knittle and Guarino 1976). Traps are made of nylon netting, hardware cloth, and wood, and come in many different sizes and designs, depending on the species of birds being captured. The entrance of the traps also vary greatly from swinging-door, one-way door, funnel entrance, to tip-top sliding doors. Traps are baited with grains or other food material or appear to be ideal nesting sites to attract the target birds.

Clover, funnel, and common pigeon traps are enclosure traps made of nylon netting or hardware cloth and come in many different sizes and designs, depending on the species of birds being captured. The entrance of the traps also vary greatly from swinging-door, one-way door, funnel entrance, to tip-top sliding doors. Traps are baited with grains or other food material which attract the target birds. WS-Kansas standard procedure when conducting trapping operations is to ensure that an adequate supply of food and water is in the trap to sustain captured birds for several days. Active traps are checked daily, every other day, or as appropriate, to replenish bait and water and to remove captured birds.

Cannon and rocket nets are normally used for larger birds such as waterfowl, but can be used to capture a wide variety of avian species. Cannons use mortar projectiles to propel a net up and over birds which have been baited to a particular site. Birds are taken from the net and disposed of appropriately.

Net guns have occasionally been used by WS to catch target waterfowl. These shoot from a “rifle with prongs”, go about 20 yards, and wrap around the target animal.

Mist nets are very fine mesh netting used to capture several species of birds. Birds cannot see the netting when it is in place because the mesh is very fine, and they strike the net and become entangled. Net mesh size determines which birds can be caught and overlapping “pockets” in the net cause birds to entangle themselves when they fly into the net (Day et al. 1980). These nets can be used for capturing small-sized birds such as house sparrows and finches entrapped in warehouses and other structures. They can also be used to capture some larger birds such as blackbirds and starlings when they are going to a roost or feeding area. Mist nets are monitored closely, typically watched from a discreet location. Mist nets when used outdoors will be monitored at least hourly and any nontarget species, especially T&E species, can be released quickly and unharmed. Mist nets are more often used in buildings to catch birds such as sparrows and finches.

Bow nets are small circular net traps used for capturing birds and small mammals. The nets are hinged and spring loaded so that when the trap is set it resembles a half moon. The net is set over a food source and if triggered by an observer using a pull cord.

Hand nets are used to catch birds and small mammals in confined areas such as homes and businesses. These nets resemble fishing dip nets with the exception that they are larger and have long handles. A variant on the hand net is a round thrown net with weights at the edges of the net, similar to that used for fishing. This net is also used for capturing birds in urban areas.

Drive traps are used to herd some animals into pens where they are captured and these are known as drive traps. Drive traps have been used for species such as Canada Geese, domestic waterfowl, jackrabbits (*Lepus* spp.), and ungulates. A drive-trap consists typically of wire panels that are erected into a 4 m² to 25 m² pen, depending on the number of geese or other target species, with two wings made of 1.5m high plastic fencing extending 20-100m in a ‘V’ from the pen. Target species are herded to the pen at each site with people on foot or in boats, depending on the target species and the existing conditions. WS uses the standard “drive-trap” (Addy 1956) to capture Canada Geese or domestic waterfowl during the molt (May-July) in some States for relocation or euthanasia.

Raptor traps come in a variety of styles such as the bal-chatri, Swedish goshawk trap, and purse traps. These have been used by WS at airports to capture raptors to remove them from the airfield. Raptors captured, have been banded and mostly relocated with this method. Raptor traps are also used to remove birds from areas around nesting T&E shorebirds. Disposition of captured raptors is determined after consultation with the local USFWS office.

Padded-jaw pole traps (Figure 10) are modified No. 0 or 1 coil spring foot hold traps used to capture specific target birds such as raptors, magpies and crows. These are placed on top of poles or typical roosting spots frequented by targeted birds. These traps are monitored frequently and nontarget species can be released unharmed.

Snap traps are modified rat snap traps used to remove individual woodpeckers, starlings, and other cavity use birds. The trap treadle is baited with peanut butter or other taste attractants and attached near the damage area caused by the woodpecker. These traps pose no imminent danger to pets or the public.

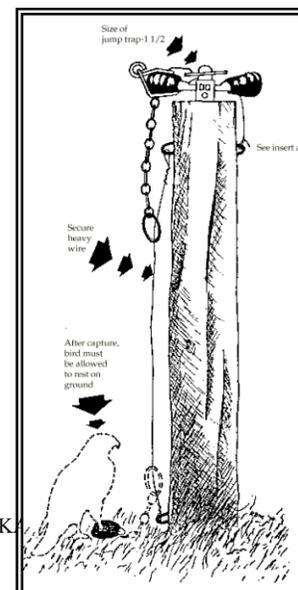


Figure 10. Padded-jaw pole trap.

Shooting is used selectively for target species but may be relatively expensive because of the staff hours sometimes required. Nevertheless, shooting is an essential WDM method. Removal of feral pigeons may be achieved by night shooting with an air rifle and be quite effective in a short period. Shooting can also be a good method to target individual birds. However, shooting is mostly ineffective for flocking birds.

Lethal reinforcement through shooting is often necessary to ensure the continued success in bird scaring and harassment efforts (see the discussion on shooting under Frightening Devices). This is especially important where predatory birds are drawn by birthing activities, aquiculture facilities, sanitary landfills, and other locations where food is available. In situations where the feeding instinct is strong, most birds quickly adapt to scaring and harassment efforts unless the WDM program is periodically supplemented by shooting.

The risk of lead poisoning caused by eagles ingesting lead in carcasses killed by shooting, other than aerial hunting, has also been discussed with the USFWS. WS-Kansas personnel do use lead based ammunition in rifles and sometimes shotguns. WS-Kansas personnel retrieve carcasses where possible to reduce the risk of lead poisoning. This has been discussed with the USFWS. Because of the recognized potential hazard associated with lead, WS-Kansas often uses steel or other non-toxic shot as necessary to minimize the risk of lead poisoning to scavengers. The USFWS did not identify this as a concern in their BO (USDA 2015) which covered potential adverse effects on Bald Eagles from all WS used WDM methods, including shooting.

Sport hunting is sometimes recommended by WS-Kansas as a viable BDM method when the target species can be legally hunted. A valid hunting license and other licenses or permits may be required by KDWP and USFWS for certain species. This method provides sport and food for hunters and requires no cost to the landowner. Sport hunting is occasionally recommended if it can be conducted safely for pigeon damage management around feedlots and dairies and for Sandhill Cranes, Canada Geese, Snow Geese, and other damage causing waterfowl.

Egg, nest, and hatchling removal and destruction can be a means of maintaining populations of a damaging avian species at a static level. Nesting populations of Canada Geese and gulls, especially if located near airports, may pose a threat to public health and safety, as well as equipment. Pigeons and starlings can also cause extensive damage to public facilities. Egg and nest destruction is used mainly to control or limit the growth of a nesting population in a specific area through limiting reproduction of offspring or removal of nest to other locations. Egg and nest destruction is practiced by manual removal of the eggs or nest.

Some species frequently attack people to guard their nests. In Kansas, species that will actually hit people are Canada Geese and Mississippi Kites. This causes concern when the nest is located near a door or exit to a residential house or business. Of greatest concern is the threat to elderly people or bicyclist who may fall in response to the attack. Where these are creating a significant nuisance, WS-Kansas may remove the nest, eggs, or hatchlings.

Egg addling or oiling is the practice of destroying the embryo prior to hatching. Egg addling is conducted by vigorously shaking an egg numerous times which causes detachment of the embryo from the egg sac. Egg oiling (a liquid spray) does not allow an egg to breathe or get oxygen, which prohibits the embryo from developing. Eggs are oiled and addled so that birds do not re-nest at least for an extended period; for example, Canada Geese will set on eggs an average of 14.2 days beyond the expected hatch date for addled eggs. Egg destruction can be accomplished in several different ways, but the most commonly used methods are manually gathering eggs and breaking them. This method is practical only during a relatively short time interval and requires

skill to properly identify the eggs and hatchlings of target species. Some species may persist in nesting and the laying of eggs, making this method ineffective.

Chemical immobilizing and euthanizing drugs are important tools for managing wildlife. Under certain circumstances, WS-Kansas personnel are involved in the capture of animals where the safety of the animal, personnel, or the public are compromised and chemical immobilization provides a good solution to reduce these risks. For example, chemical immobilization has often been used to take mountain lions, coyotes, and raccoons in residential areas where public safety is at risk. It is also used to take nuisance waterfowl that cannot be easily captured with other methods. WS-Kansas employees that use immobilizing drugs are certified for their use and follow the guidelines established in the WS Field Operational Manual for the Use of Immobilization and Euthanasia Drugs. Euthanasia is usually performed with drugs such as Beuthanasia-D® or Fatal-Plus® which contain forms of sodium phenobarbital. Euthanized animals are disposed of by incineration or deep burial to avoid secondary hazards. Drugs are monitored closely and stored in locked boxes or cabinets according to WS policies, and Department of Justice, Drug Enforcement Administration or FDA guidelines. Most drugs fall under restricted-use categories and must be used under the appropriate license from the U.S. Department of Justice, Drug Enforcement Administration which WS-Kansas does hold. A-C is currently regulated by FDA.

Euthanasia can be accomplished with several methods. Lethal methods considered by WS to address bird damage include live-capture followed by euthanasia, the avicide DRC-1339, shooting, egg destruction, and the recommendation of legal hunting practices, where appropriate. Target birds would be euthanized using cervical dislocation, carbon dioxide, or firearms once birds were live-captured using other methods. Cervical dislocation, carbon dioxide, and firearms are considered conditionally acceptable forms of euthanasia for birds (AVMA 2013). Several drugs and methods are available to euthanize captured animals. These methods are completely species specific and animals euthanized with drugs are buried or incinerated.

Chemical pesticides have been developed to reduce or prevent wildlife damage and are widely used because of their efficiency. Although some pesticides are specific to certain groups of species (e.g. birds vs. mammals), pesticides are typically not species specific, and their use may be hazardous unless used with care by knowledgeable personnel. The proper placement, size, type of bait, and time of year are keys to selectivity and successful use of pesticides for WDM. When a pesticide is used according to its EPA registered label, it poses minimal risk to people, the environment and non-target species. Neither EPA nor KDA would register a chemical that had not undergone rigorous environmental testing to determine its potential effects on humans and the environment including risks to nontarget species. Since the tests required by EPA to register a chemical, development of appropriate pesticides is expensive, and the path to a suitable end product is filled with legal and administrative hurdles. Few private companies are inclined to undertake such a venture. Most pesticides are aimed at a specific target species, yet suitable pesticides are not available for most animals. Available delivery systems make the use of pesticides unsuitable in many wildlife damage situations. This section describes the pesticides used by WS-Kansas in BDM.

DRC-1339 (EPA Reg. No. 56228-63), 3-chloro-4-methylbenenamine hydrochloride, is an avian pesticide registered with EPA. For more than 30 years, DRC-1339 has proven to be an effective method of starling, blackbird, gull, crow, raven, magpie, and pigeon damage management (West et al. 1967, West and Besser 1976, Besser et al. 1967, and DeCino et al. 1966). DRC-1339 is a slow acting avicide that is rapidly metabolized into nontoxic metabolites and excreted after

ingestion. This chemical is one of the most extensively studied and evaluated pesticides ever developed. Because of its rapid metabolism, DRC-1339 poses little risk of secondary poisoning to non-target animals, including avian scavengers (Cunningham et al. 1979, Schafer 1984, Knittle et al. 1990). This compound is also unique because of its relatively high toxicity to most pest birds but low-to-moderate toxicity to most raptors and almost no toxicity to mammals (DeCino et al. 1966, Palmore 1978, Schafer 1981). For example, starlings, a highly sensitive species, require a dose of only 0.3 mg/ bird to cause death (Royall et al. 1967); many other bird species such as raptors, House Sparrows, and eagles are classified as non-sensitive (USDA 1997). Numerous studies show that DRC-1339 poses minimal risk of primary poisoning to non-target and T&E species (USDA 1997). Secondary poisoning has not been observed with DRC-1339 treated baits. During research studies, carcasses of birds which died from DRC-1339 were fed to raptors and scavenger mammals for 30 to 200 days with no symptoms of secondary poisoning observed (Cunningham et al. 1979). This can be attributed to relatively low toxicity to species that might scavenge on birds killed by DRC-1339 and its tendency to be almost completely metabolized in target birds leaving little residue for scavengers to ingest. Secondary hazards of DRC-1339 are almost non-existent. DRC-1339 acts in a humane manner producing a quiet, painless death. Prior to the application of DRC-1339, pre-baiting is required to monitor for non-target species that may consume any bait. If non-target species are observed, then the use of DRC-1339 would be postponed or not applied. Research studies and field observations suggest that DRC-1339 treatments kill about 75% of the blackbirds and starlings at treated feedlots (Besser et al. 1967). Mitigation measures to avoid negative impacts to T&E species as well as the inherent safety features of DRC-1339 that preclude hazards to most species other than the target species listed above.

DRC-1339 is unstable in the environment and degrades rapidly when exposed to sunlight, heat, or ultra violet radiation. DRC-1339 is highly soluble in water but does not hydrolyze and degradation occurs rapidly in water. DRC-1339 tightly binds to soil and has low mobility. The half life is about 25 hours, which means it is nearly 100% broken down within a week, and identified metabolites (i.e., degradation chemicals) have low toxicity. Aquatic and invertebrate toxicity is low (USDA 2015). USDA (2015, Appendix P) contains a thorough risk assessment of DRC-1339 and that assessment concluded that no adverse effects to T&E species are expected from use of DRC-1339.

DRC-1339 concentrate is used effectively under five EPA registered labels to reduce damage by specific bird species. Hard-boiled eggs and meat baits are injected with DRC-1339 and used to reduce raven, crow, and magpie damage for the protection of newborn livestock, the young or eggs of threatened, endangered, or sensitive species, human health and safety, and silage and fodder bags. It is also registered for application on grain, poultry pellets, raisins, and cull French fries to reduce damage caused by blackbirds and starlings at livestock and poultry feedlots. A similar label allows DRC-1339 to be used at blackbird and starling staging areas associated with nighttime roosts with similar baits. The label has been supplemented in Texas under a Special Local Need to reduce crow damage to pecans which could be done in Kansas. Another label allows DRC-1339 to be used on whole kernel corn to reduce health, nuisance, or economic problems caused by pigeons in and around structures in non-crop areas. A fifth label allows the use of DRC-1339 on bread cube baits to reduce damage caused by several species of gulls that, during their breeding season, prey on other colonially nesting bird species, or damage property and crops. The specified gull species can be managed to reduce damage or damage threats on their breeding grounds or several other areas including airports and landfills and for T&E species and human health and safety protection.

The use of DRC-1339 as per label instructions will have little effect on nontarget species in Kansas. DRC-1339 baits cannot be used in areas where potential consumption of treated baits by T&E species could occur. Observation of sites to be treated with or without prebaiting is necessary to determine the presence of nontarget species. DRC-1339 baits cannot be used directly in water or areas where runoff is likely.

Avitrol[®], 4-Aminopyridine, is often used as a chemical frightening agent (repellent) for blackbirds and starlings (mixed at a 1:99 ratio with untreated bait material, i.e., cracked corn), but it can be used as a toxicant at 1:9 ratio for pigeons, house sparrows, and other commensal birds. *Avitrol*[®] treated bait is placed in an area where the targeted birds are feeding and birds that consume treated baits normally die (Johnson and Glahn 1994). Birds display abnormal flying behavior after ingesting treated baits and emit distress vocalization (pigeons do not). This chemical is not normally used at airports because the abnormal flying behavior could cause affected birds to fly into the path of aircraft. *Avitrol*[®] is a restricted use pesticide that can only be sold to certified applicators and is available in several bait formulations where only a small portion of the individual grains carry the chemical. Any granivorous bird associated with the target species could be affected by *Avitrol*[®] which none of the T&E species in the United States are. Blackbirds and corvids are slightly more sensitive to the chemical than other species of mammals and birds. In addition, chronic toxicity has not been demonstrated (Schafer 1991). Laboratory studies with predator and scavenger species have shown minimal potential for secondary poisoning. However, in a field study, magpies and crows may have been affected secondarily (Schafer 1991). A laboratory study showed, though, that magpies which fed for 20 days on birds killed with 2 to 3.2 times the lethal dose of active ingredient were not affected (Schafer et al. 1974). Similarly, American kestrels that fed on blackbirds for 7 to 45 days which had died from a lethal dose of *Avitrol*[®] were not adversely affected (Schafer 1991). Therefore, no probable secondary risk is expected with use of this compound, even for pets and the public. *Avitrol*[®] is water soluble, but laboratory studies demonstrated that *Avitrol*[®] is strongly absorbed onto soil colloids and has moderately low mobility. Biodegradation is expected to be slow in soil and water, with a half-life ranging from 3 to 22 months. *Avitrol*[®] may form covalent bonds with humic materials, which may serve to reduce its bioavailability in aqueous media. *Avitrol*[®] is non-accumulative in tissues and rapidly metabolized by many species (Schafer 1991). WS-Kansas has not used *Avitrol*[®] in the last 4 FYs (FY15 – FY18), but could be used for urban bird damage situations. Use of *Avitrol*[®] by WS-Kansas is not likely to have an adverse affect on T&E species, especially because it will be used according to label restrictions and primarily in urban environments by WS-Kansas.

Chemosterilants and Contraception. Contraceptive measures can be grouped into four categories: surgical sterilization, oral contraception, hormone implantation, and immunocontraception (i.e., the use of contraceptive vaccines). These techniques would require that each individual animal receive either single, multiple, or possibly daily treatment to successfully prevent conception. The use of oral contraception, hormone implantation, or immunocontraception is subject to approval by Federal and State regulatory agencies. Surgical sterilization and hormone implantation are generally impractical because it requires that each animal be captured, sterilization conducted by licensed veterinarians, and, thus, would be extremely labor intensive and expensive. As alternative methods of delivering sterilants are developed, sterilization may prove to be a more practical tool in some circumstances (DeLiberto et al. 1998). Reduction of local populations could conceivably be achieved through natural mortality combined with reduced fecundity. No animals would necessarily be killed directly with this sterilization, however, and sterilized animals could continue to cause damage. Thus, sometimes culling the population to the desired level and then implementing a sterilization program would be the optimal solution to overabundant bird populations. Populations of

dispersing animals would probably be unaffected. Potential environmental concerns with chemical sterilization would still need to be addressed, including safety of genetically engineered vaccines to humans and other wildlife. Several formulations of drugs have been and are being tested by NWRC and other researchers including nicarbazin, diazacon, and immunocontraceptives. These would have to be registered for use in Kansas before WS-Kansas would use them. The only EPA approved contraceptive available is OvoControl™ G for Canada Geese in urban areas (population greater than 50,000) and FAA certificated airport environments. The active ingredient in OvoControl™ G is nicarbazin which was developed by WS NWRC researchers (WS 2004). Nicarbazin, a drug approved by FDA for use to control coccidiosis in chickens for the last 45 years, reduces the hatchability of eggs. This reduction only occurs while the bait is being consumed and, thus, primary and secondary hazards to other bird species and mammals are minimized or nullified. Following label directions further minimizes nontarget hazards. In Kansas, the use of this bait would have no effect on T&E or sensitive species, people, pets, or the environment. WS-Kansas has not used OvoControl™ G, but could following registration with KDA. It is expected that this chemical would have minimal effect on the resident Canada goose population in Kansas in the short-term because geese are long-lived. However, combined with culling, it would be effective at keeping local populations at manageable numbers.

3.3.2 Alternative 2 - Nonlethal BDM by WS-Kansas Only

Under this alternative, WS would be required to implement non-lethal methods only to resolve damage caused by birds in Kansas. Only those methods discussed in Appendix B that are considered non-lethal would be employed by WS. No lethal take of birds would occur by WS. The use of lethal methods could continue to be used under this alternative by those persons experiencing damage by birds when permitted by the USFWS and/or KDWPT, when required. The non-lethal methods that could be employed or recommended by WS under this alternative would be identical to those methods identified in any of the alternatives. Non-lethal methods would be employed by WS in an integrated approach under this alternative.

Exclusionary devices can be effective in preventing access to resources in certain circumstances. The primary exclusionary methods are netting and overhead lines. Exclusion is most effective when applied to small areas to protect high value resources. However, exclusionary methods are neither feasible nor effective for protecting human safety, agricultural resources, or native wildlife species from birds across large areas. The non-lethal methods used or recommended by WS under this alternative would be identical to those methods identified in any of the alternatives. WS would not apply for a depredation permit from the USFWS and/or KDWPT under this alternative because no take of birds would occur.

In situations where non-lethal methods were impractical or ineffective to alleviate damages, WS could refer requests for information regarding lethal methods to KDWPT, the USFWS, local municipalities, local animal control agencies, or private businesses or organizations. Under this alternative, however, property owners/managers might be limited to using non-lethal methods only as they may have difficulty obtaining permits for lethal methods. The USFWS needs professional recommendations on individual damage situations before issuing a depredation permit for lethal methods, and the USFWS does not have the mandate or resources to conduct activities related to wildlife damage management. State agencies with responsibilities for migratory birds would likely have to provide this information if depredation permits were to be issued. If the information were provided to the USFWS, following the agency's review of a complete application package for a depredation permit from a property owner or manager to

lethally take birds, the permit issuance procedures would follow that described in the proposed action/no action alternative.

Property owners or managers could conduct management using any non-lethal or lethal method that was legal, once a permit had been issued for lethal take, when required. Property owners or managers might choose to implement WS' non-lethal recommendations, implement lethal methods, or request assistance from a private or public entity other than WS. Property owners/managers frustrated by the lack of WS' assistance with the full range of methods may try methods not recommended by WS or use illegal methods (*e.g.*, poisons). In some cases, property owners or managers may misuse some methods or use some methods in excess of what is necessary, which could then become hazardous and pose threats to the safety of humans and non-target species. The USFWS may authorize more lethal take than was necessary to alleviate bird damages and conflicts because agencies, businesses, and organizations may have less technical knowledge and experience managing wildlife damage than WS.

The proposed action, using an integrated damage management approach, incorporates the use of non-lethal methods when addressing requests for assistance. In those instances where non-lethal methods could effectively resolve damage caused by birds, those methods would be used or recommended under the proposed action. Because non-lethal methods would be available for use under the alternatives analyzed in detail, this alternative would not add to the analyses.

This alternative was not analyzed in detail because the take of birds and the destruction of active nests that contain eggs and/or nestlings could continue at the levels analyzed in the proposed action alternative. The USFWS and/or the KDWPT could permit the take, when required, despite WS' lack of involvement in the action. In addition, limiting the availability of methods under this alternative to only non-lethal methods could be inappropriate when attempting to address threats to human safety expeditiously, primarily at airports.

3.3.3 Alternative 3 - WS-Kansas Provides Technical Assistance Only for BDM

Under this alternative, WS would provide those cooperators requesting assistance with technical assistance only. Technical assistance would provide those cooperators experiencing damage or threats of damage with information, demonstrations, and recommendations on available and appropriate methods available. The implementation of methods and techniques to alleviate or prevent damage would be the responsibility of the requester with no direct involvement by WS. In some cases, WS may provide supplies or materials that were of limited availability for use by private entities (*e.g.*, loaning of propane cannons). Similar to the proposed action alternative, a key component of assistance provided by WS would be providing information to the requester about wildlife and wildlife damage. Educational efforts conducted under the proposed action alternative would be similar to those conducted under this alternative.

Technical assistance would include collecting information about the species involved, the nature and extent of the damage, and previous methods that the cooperator had used to alleviate the problem. WS would then provide information on appropriate methods that the cooperator may consider to alleviate the damage themselves. Types of technical assistance projects may include a visit to the affected property, written communication, telephone conversations, or presentations to groups such as homeowner associations or civic leagues.

Generally, several management strategies would be described to the requester for short and long-term solutions to managing damage based on the level of risk, need, and the practicality of their application.

Only those methods legally available for use by the appropriate individual would be recommended or loaned by WS. Similar to Alternative 1, those methods described in Appendix B would be available to those people experiencing damage or threats associated with birds in the state, except for DRC-1339, which is currently only available for use by WS.

Those entities seeking assistance with reducing damage could seek direct operational assistance from other governmental agencies, private entities, or conduct activities on their own. In situations where non-lethal methods were ineffective or impractical, WS could advise the property owner or manager of appropriate lethal methods to supplement non-lethal methods. In order for the property owner or manager to use lethal methods, they would be required to apply for their own depredation permit to take birds from the USFWS and/or KDWPT, when a permit was required. WS could evaluate damage occurring or the threat of damage and complete a Migratory Bird Damage Report, which would include information on the extent of the damages or risks, the number of birds present, and a recommendation for the number of birds that should be taken to best alleviate damage or the threat of damage. Following review by the USFWS of a complete application for a depredation permit from a property owner or manager and the Migratory Bird Damage Report, the USFWS could issue a depredation permit to authorize the lethal take of a specified number of birds.

This alternative would place the immediate burden of using methods to alleviate damage on the resource owner, other governmental agencies, and/or private businesses. Those entities could take action using those methods legally available to alleviate or prevent bird damage as permitted by federal, state, and local laws and regulations or those persons could take no action.

3.3.4 Alternative 4 - No Federal WS-Kansas BDM

This alternative would preclude any activities by WS to reduce threats to human health and safety, and alleviate damage to agricultural resources, property, and natural resources. WS would not be involved with any aspect of bird damage management in the state. All requests for assistance received by WS to alleviate damage caused by birds would be referred to the USFWS, to KDWPT, and/or to private entities. This alternative would not deny other federal, state, and/or local agencies, including private entities, from conducting damage management activities directed at alleviating damage and threats associated with birds in the state. Therefore, under this alternative, entities seeking assistance with addressing damage caused by birds could contact WS but WS would immediately refer the requester to other entities. The requester could then contact other entities for information and assistance, could take actions to alleviate damage without contacting any entity, or could take no further action.

Many of the methods listed in Appendix B would be available for use by other agencies and private entities to manage damage and threats associated with birds. All methods described in Appendix B would be available for use by those persons experiencing damage or threats, except for the use of DRC-1339.

3.4 ALTERNATIVES CONSIDERED BUT NOT ANALYZED IN DETAIL WITH RATIONALE

Several alternatives were considered but not analyzed in detail. The prior EA (WS 2008) discussed several alternatives that were not discussed in detail and the discussion in this EA would be the same. The reader is referred to WS (2007) for a detailed discussion of these issues, but these will only be given here.

- Compensation for Bird Damage Losses

- Short Term Eradication and Long Term Population Suppression
- Use of Bird-Proof Feeders in Lieu of Lethal Control at Dairies and Cattle Feeding Facilities

Additionally a few other alternatives will not be analyzed in detail and are given with a discussion of why they were not considered for detailed analysis in Chapter 4.

3.4.1 Lethal BDM Only By WS

Under this alternative, WS-Kansas would not conduct any nonlethal control of birds for BDM purposes in the State, but would only conduct lethal BDM. This alternative was eliminated from further analysis because many situations can be resolved effectively through nonlethal means. For example, for blackbird roosts in urban areas, WS-Kansas has used nonlethal methods exclusively as an effective means to resolving damage. Lethal BDM only does not interface with the overall concept of IWDM, where multiple methods can achieve a desired cumulative effect. Restricting that portion of the program to lethal methods only would likely not be socially acceptable to various agencies, groups and individuals.

3.4.2 Relocation Rather Than Killing Problem Wildlife

Translocation may be appropriate in some situations (i.e., if the problem species' population is at very low levels such as the kit fox, suitable relocation sites are available, and the additional dollars required for relocation can be obtained). However, those species that often cause damage problems (e.g. coyotes, red fox, black bears, mountain lions) are relatively abundant or are not native (e.g. feral cats) and relocation is not necessary for the maintenance of viable populations. Relocation may also result in future depredations if the relocated animal encounters protected resources, and in some cases could require payment of damage compensation claims. Any decisions on relocation of wildlife by WS-Kansas are coordinated with KDWP or USFWS and consultation with the appropriate land management agency(ies) or manager associated with proposed release sites.

The American Veterinary Medical Association, the National Association of State Public Health Veterinarians, and the Council of State and Territorial Epidemiologists oppose the relocation of mammals due to the potential for disease transmission to a healthy local population. This is particularly true for small mammals such as raccoons or skunks (Center for Disease Control 1990). Although relocation is not necessarily precluded, in many cases, it would be logistically impractical and biologically unwise. Relocation of wildlife is also discouraged by APHIS-WS policy (WS Directive 2.501) because many factors can affect the outcome (stress to the relocated animal, poor survival rates, and difficulties in adapting to new locations or habitats). However, there may be exceptions for relocating certain species. Relocation of problem wildlife might be a viable solution and acceptable to the public with wildlife that is considered to be of high value such as T&E or sensitive species.

3.4.3 Biological Control

The introduction of a species or disease to control another species has occurred throughout the world. Unfortunately, many of the introduced species become pests themselves. For example, in Hawaii, the Indian mongoose (*Herpestes auropunctatus*) was brought in to control rats (*Rattus* spp.), but wound up causing declines in many native Hawaiian bird species. Though many people think that this is a good idea for small flocking birds, WS-Kansas dismissed it from further consideration because technology has

not advanced to the point that biological control, even for non-native species such as the starling, is feasible and safe.

3.5 WS-Kansas BDM Operating Policies

Operating policies refer to any aspect of an action that serves to prevent, reduce, or compensate for negative impacts that otherwise might result from that action. The current program, nationwide and in Kansas, uses many such policies. The key policies are incorporated into all alternatives as applicable, except the no federal program alternative (Alternative 4). Most policies are instituted to abate specific issues while some are more general and relate to the overall program. Operating policies include those recommended or required by regulatory agencies such as EPA and these are listed where appropriate. Additionally, specific measures to protect resources such as T&E species that are managed by WS-Kansas's cooperating agencies (USFWS and KDWP) are included in the lists below (USDA 2015).

3.5.1 General Operating Policies Used by WS-Kansas in BDM

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- WS-Kansas complies with all applicable laws and regulations that pertain to conducting BDM on private and public lands.
- WS-Kansas coordinates with agency officials for work on public lands to identify and resolve any issues of concern with BDM.
- WS-Kansas coordinates with tribal officials for work on tribal lands to identify and resolve any issues of concern with BDM.
- The use of BDM methods such as traps and avicides conform to applicable rules and regulations administered by the State.
- WS-Kansas personnel adhere to all label requirements for toxicants. EPA approved labels provide information on preventing exposure to people, pets, and T&E species along with environmental considerations that must be followed. WS-Kansas personnel abide by these. These restrictions invariably preclude or reduce exposure to nontarget species, the public, pets, and the environment.
- The WS Decision Model WS-Directive 2.201 is used by WS-Kansas in deciding the most effective and economical strategies to resolve wildlife damage issues.

3.5.2 WS-Kansas Operating Policies Specific to the Issues

The following is a summary of the Operating Policies used by WS-Kansas that are specific to the issues listed in Chapter 2 of this document.

3.5.2.1 Measures to reduce impacts on Target Bird Species Populations.

- BDM is directed toward localized populations or individual offending animals, depending on the species and magnitude of the problem, and not an attempt to eradicate any native wildlife population in a large area or region.

- WS-Kansas personnel use specific trap types, lures, and placements that are most conducive for capturing the target animal.
- WS-Kansas BDM take is monitored. Both "Total Harvest" and estimated population numbers of key species are used to assess cumulative effects of harvest. WS-Kansas BDM is designed to maintain the level of harvest below that which would impact the viability of populations of native species (see Chapter 4). WS-Kansas provides data on total take of target animal numbers to agencies (i.e., USFWS, KDWPT) as appropriate.
- WS-Kansas currently has agreements for BDM on less than 1% of the land area in Kansas. This could be increased several-fold, but target bird take would be monitored to ensure that harvest remains below a level that would impact viability of a species. However, WS-Kansas will not impact bird species populations on more than 90% of the lands in Kansas.

3.5.2.2 Measures to reduce impacts on Nontarget Species Populations, Including T&E Species.

- WS-Kansas personnel are highly experienced and trained to select the most appropriate BDM method(s) for taking problem birds with little impact on nontarget species.
- WS-Kansas personnel work with research programs such as NWRC to continually improve and refine the selectivity of management devices, thereby reducing nontarget take.
- Nontarget animals captured in traps or with any other BDM method are released at the capture site unless it is determined by WS-Kansas personnel that the animal is not capable of self maintenance.
- When working in an area that has T&E or sensitive species or has the potential for T&E species to be exposed to BDM methods, WS-Kansas personnel will know how to identify the target and T&E species (e.g. Turkey Vulture vs. juvenile Bald Eagle), and apply BDM methods in consultation with USFWS.
- Avian predators of T&E or sensitive species could be captured, moved, or euthanized to enhance recruitment of the sensitive species. These actions would be conducted where they would provide a positive benefit to sensitive species with no significant negative impacts to target or nontarget populations.

- ***Measures to Reduce the Potential Take of Specific T&E or Sensitive Species***

Bald Eagle. Even though the Bald Eagle was delisted in 2007, WS-Kansas continues to implement all reasonable and prudent alternatives and measures and their terms and conditions to protect Bald Eagles. The USFWS did not mention Bald Eagles in their 2015 BO, but KS WS will still consult with the USFWS as appropriate.

Whooping Crane. WS-Kansas employees will not use avicides in areas where Whooping Cranes could potentially be found.

3.5.2.3 Measures to reduce potential impacts on Public Safety, Pets, and the Environment.

- A formal risk assessment (USDA 2018) concluded that hazards to the public from BDM devices and activities are low.

- All pesticides are registered with EPA and KDA. WS-Kansas employees will comply with each pesticide's directions and labeling, in addition to EPA and KDA rules and regulations.
- WS-Kansas personnel who use restricted use chemicals (i.e., pesticides or drugs) are trained and certified by program personnel or other experts in the safe and effective use of these materials under EPA and KDA approved programs. WS-Kansas employees who use chemicals participate in continuing education programs to keep abreast of developments and to maintain their certifications (WS Directive 2.401, 2.405).
- WS-Kansas Specialists who use firearms and pyrotechnics are trained and certified by experts in the safe and effective use of these materials (WS Directive 2.615).
- Conspicuous, bilingual warning signs, alerting people to the presence of traps, avicides, and other BDM methods, are placed at major access points when they are set in the field (WS Directive 2.450).
- Chemical immobilization and euthanasia procedures that do not cause pain or undue stress are used by certified WS-Kansas personnel when practical and where safe (WS Directive 2.401, 2.405).
- WS-Kansas personnel abide by AVMA euthanasia guidelines.
- Cage and padded-jaw foothold traps are set and inspected according to WS policy (WS Directive 2.450). Water and food are replenished as necessary in decoy traps.
- WS_NWRC research continues with the goal of improving the humaneness of WDM devices.

3.5.2.4 Measures to Reduce Potential Effects of BDM on Aesthetics

- WS-Kansas take is minimal compared with overall bird species populations, and, thus, does not impact the opportunity of the public to enjoy these species.
- WS-Kansas could conduct BDM projects that protect T&E and sensitive species which could offer the public the potential opportunity to view these rarer species.
- WS-Kansas conducts most BDM projects in areas where the public has little access, and therefore, that portion of the public that finds certain BDM methods as objectionable will not be upset by visually viewing that action.

CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

Chapter 4 provides information needed for making informed decisions in selecting the appropriate alternative for meeting the purpose and need of the proposed action. This chapter analyzes the environmental consequences of each alternative discussed in Chapter 3 in relation to the issues identified for detailed analysis in Chapter 2. This section analyzes the environmental consequences of each alternative in comparison with the proposed action to determine if the potential impacts would be greater, lesser, or the same. Therefore, the proposed action or current program Alternative 1 serves as the baseline for the analysis and the comparison of expected impacts among the alternatives. The background and baseline information presented in the analysis of the current program alternative thus also applies to the analysis of each of the other alternatives

4.1 ISSUES ANALYZED IN DETAIL

NEPA requires federal agencies to determine whether their actions have a “*significant impact on the quality of the human environment.*” The environmental consequences of the 4 alternatives are discussed below with emphasis on the issues presented in Chapter 2. The comparison of alternatives will be used to make a selection of the most appropriate alternative for WS-Kansas BDM activities. The alternatives selected for detailed assessment provide the best range of alternatives that could potentially meet the purpose and the need of BDM in Kansas as identified in Chapter 1.

4.1.1 Effects of BDM on Target Bird Species Populations

To adequately determine the magnitude of impacts in relation to birds and their populations, WS-Kansas data and known cumulative take (sportsmen harvest and permitted depredation take) will be analyzed. The authority for management of migratory birds is the USFWS and of resident bird species is KDWP. KDWP does regulate hunting of migratory game species under the direction of USFWS and monitors migratory nongame.

An aspect, perhaps overriding, that is germane to the determination of “significance” under NEPA is the effect of a federal action on the *status quo* for the environment. States have the authority to manage populations of wildlife species as they see fit, but for migratory and T&E bird species with oversight of USFWS. However, management direction for a given species can vary among states, and state management actions are not subject to NEPA compliance. Therefore, the *status quo* for the environment with respect to state-managed wildlife species is the management direction established by the States. Federal actions that are in accordance with state management have no effect on the *status quo*. Wildlife populations are typically dynamic and fluctuate without harvest or control by humans. Therefore, the *status quo* for wildlife populations is fluctuation, both within and among years, which complicates determining the significance of human impact on such populations.

4.1.1.1 Alternative 1 - Continue the Current Federal BDM Program.

Under the current program alternative, take by WS-Kansas and others will be considered Statewide providing a more comprehensive picture of impacts to bird populations. The prior EA (WS 2008) determined that BDM had no significant impacts to starling, blackbird, feral pigeon, and House Sparrow populations in Kansas. This EA has been expanded to include all bird species in Kansas to determine the magnitude of impacts for other species as well. Analyzing impacts of bird species at the statewide and

Central Flyway area provides a more comprehensive and statistically sound look at cumulative impacts because population estimates and take is statistically more credible on a statewide or regional scale, and impacts are often to a regional population because most birds migrate.

WS-Kansas BDM targets specific species and cumulative effects on those species populations from BDM and other actions are analyzed to determine the relative significance of impacts. In addition, management direction from the responsible agency (USFWS and KDWP) is a determining factor. From a NEPA standpoint, justification for a finding of “*no significant impact on the quality of the human environment*” in previous EAs with respect to WS-Kansas’s take of most birds in Kansas is the fact that WS-Kansas’s involvement has no adverse effect on the *status quo* because, if WS-Kansas was not available, under USFWS or KDWP authority, virtually the same birds that are killed by WS-Kansas could be taken by other agency or private actions. This suggests that, if WS-Kansas stopped its involvement in most bird management, there would be virtually no change in environmental effects or in cumulative environmental effects. Additionally, land owners that are given assistance with damage problems are much more likely to have a favorable view of wildlife (International Association of Fish and Wildlife Agencies 2004).

A “viable” wildlife population can exist at many levels between one that is at carrying capacity (the maximum number of a species that a particular habitat can support) and one that is at only a fraction of carrying capacity. Because rates of increase are density dependent (i.e., the population grows at a faster rate as the population is reduced in relation to carrying capacity), bird populations have the ability to recover from declines that might result from mistakes in management. History has borne this out by the fact that efforts in the early half of the 20th century to eradicate some of the larger mammalian predator species (i.e., coyotes, black bears, and mountain lions) failed to do so. However, the larger predators’ numbers were most likely reduced substantially (Evans 1983). Density dependent rates of increase are a built-in mechanism of most wildlife populations that serve to reduce effects of population reductions whether by harvest, localized control, or non-man-induced mortality. This provides additional assurance that a viable population of a target species would be maintained in Kansas, even if a sustainable harvest rate is exceeded in the short term in areas where the objective is to maintain the population.

The methods used by WS-Kansas to take target bird species under the current program are the same as those that have been used in recent years and were described in Section 3.3. The methods used in each damage situation depend on the species causing damage and other factors including location (public versus private lands), weather, and time of year as discussed in section 3.5. The methods include physical exclusion, frightening devices, shooting, cage traps, padded-jaw pole traps, and avicides. Many BDM methods, especially those that can be safely implemented, may only be recommended by WS-Kansas personnel and incorporated by the resource owner.

WS-Kansas uses lethal and nonlethal methods as needed for appropriate biologically sound, effective BDM. Analysis of this issue is limited primarily to those species most often killed during WS-Kansas BDM; however, nonlethal BDM will be analyzed for potential impacts as well. Magnitude may be determined either quantitatively or qualitatively. Quantitative determinations are based on population estimates, allowable harvest levels, and actual harvest data. Qualitative determinations are based on population trends and harvest data when available. Generally, WS-Kansas only conducts BDM on species whose population densities are high and usually only after they have caused damage.

Impacts on Bird Populations from Lethal Take in BDM

WS-Kansas conducted lethal BDM annually from FY15 to FY18 for 11 primary bird species in Kansas, but has the potential for dealing with many more species. WS-Kansas took 40 species from FY15 to FY18 (Table 4). The species that cause damage are listed in Section 1.2 with general information about them and the agency, USFWS, KPDWT, or WS-Kansas, that has primary responsibility for responding to

damage complaints involving them. The primary target species taken yearly in Kansas are introduced commensal species (European Starlings, feral pigeons, House Sparrows), Blackbirds (7 species as discussed), Canada Geese, Mallards, Cattle Egrets, Ring-billed Gulls, and Mourning Doves. Additionally, WS-Kansas has taken only minimal numbers of 29 species. Of the annual take of birds from FY15 to FY18, 98% of the take were 2 species: starlings (86%) and feral pigeons (12%). Brown-headed Cowbirds, Canada Geese, Mourning dove, and Cattle egrets combined for (1%) of the total take and the remaining 36 species accounted for about 1% of WS-Kansas's lethal take.

Table 4. Birds killed by WS-Kansas in BDM from FY15 to FY18. Take was estimated for species killed with toxicants.

Species	FY15	FY16	FY17	FY18	Ave
Introduced					
European Starling*	1,062	28,537	666	109,187	34,863
Feral (Rock) Pigeon*	3,501	4,228	4,774	6,597	4,775
House Sparrow*	4	8	15	11	10
Blackbirds					
Red-winged Blackbird	8	3	4	-	4
Brown-headed Cowbird	535	153	147	54	222
Common Grackle	56	68	2	50	44
Great-tailed Grackle	2	39	23	-	16
Yellow-headed Blackbird	-	-	-	1	-
Waterfowl					
Canada Goose	-	79	49	137	66
Snow Goose	-	1	-	-	-
Mallard	-	4	4	25	8
Northern Shoveler	-	-	1	2	1
Blue-winged Teal	-	-	2	3	1
American Coot	1	-	-	-	-
Wading Birds					
Cattle Egret	37	93	147	52	82
Snowy Egret	2	1	-	2	1
Great Egret	1	1	3	1	1
Great Blue Heron	1	1	2	-	1
Little Blue Heron	1	-	-	-	-
Gulls					
Ring-billed Gull	-	35	1	-	9
Franklin's Gull	1	5	7	17	8
Raptors					
Red-tailed Hawk	1	6	1	2	3
Swainson's Hawk	-	5	7	2	4
Turkey Vulture	11	7	7	5	8
Northern Harrier	-	-	7	3	2
Rough-Legged Hawk	-	-	-	2	-
American Kestrel	-	-	-	1	-
Misc. Birds					
Killdeer	-	6	7	6	5
Upland Sandpiper	-	2	-	1	1
Mourning Dove	98	27	66	264	114
Eurasian Collared Dove	1	3	3	-	2
American Crow	5	4	2	8	5
Cliff Swallow	22	33	175	23	63
Barn Swallow	1	3	5	-	2
Blue Jay	5	-	-	-	1
Eastern Meadowlark	3	-	3	1	2
Horned Lark	1	-	1	2	1
Common Nighthawk	2	-	-	-	1
Wild Turkey	6	20	-	4	8

*Take includes estimates with avicides as well as other lethal BDM methods

WS-Kansas uses several BDM methods that result in the lethal take of birds. The greatest number of birds is lethally taken with chemical methods (especially European Starlings). WS-Kansas used 3 birds

birds taken with chemicals from FY15 to FY18, was DRC-1339. Table 3 (Section 2.1.3) gives the amount of chemical used by WS-Kansas. However, take with DRC-1339 and Avitrol® needs to be estimated because only dead birds found are recorded in the MIS (Appendix B). Thus, to determine the number of birds taken by WS-Kansas lethally, take needs to be estimated for DRC-1339 and Avitrol®. The MIS does not record wastage (chemicals disposed of by deep burial because project failed due to birds not being present or fewer than expected the day of treatment which for DRC-1339 is critical because the shelf-life, once a bait is mixed, is about 3 to 7 days depending on environmental factors such as heat and humidity). Thus, bird take estimates from Appendix B with DRC-1339 and Avitrol® are likely high because bait is picked often up at the conclusion of a project, and sometimes mixed and never used.

For the purposes of the take estimates, take with DRC-1339 can conservatively be estimated for each species based on daily consumption and the bait applied by WS; this is discussed thoroughly in Appendix B. When a species was specified, the chemical take was estimated for that species. Blackbird take, including starlings, is often combined as blackbird (mixed species) in the MIS. Projects involving mixed blackbirds in feedlots have been estimated to be 95% starlings and 5% other blackbirds by WS-Kansas. The other blackbirds were divided to species by the typical composition of birds found in Kansas during the time of year the project took place.

WS-Kansas (WS 2015) personnel estimated that the composition of blackbirds at CAFOs where DRC-1339 treated baits were placed was 97% starling, with the remaining 2% composed of Red-winged Blackbird, and a combined 0.1% to 1% for Brown-headed Cowbird, Brewer's Blackbird, Common Grackle, and Great-tailed Grackle. Another note, DRC-1339 treated baits are often greased which tend to target starlings which are prevalent at feedlots during winter when insect are relatively unavailable; starlings, requiring a high protein diet, favor the treated baits over the other blackbirds found in feedlots and will seek them out whereas the other blackbirds will eat what is available searching more for grain (Twedt 1985). Thus, fewer blackbirds, but more starlings are likely taken by WS-Kansas than estimated as discussed in Appendix B.

Introduced Commensal Bird Population Impacts

Three common commensal (species that live in close association with man) bird species in Kansas, and potentially a fourth with the rapid expansion of the Eurasian Collared-Dove (discussed under dove impacts), are not indigenous to North America and are not protected by federal or state law. These species cause common damage problems, especially associated with roosting and feeding at CAFOs. The take of these species by WS-Kansas is considered to be of no significant impact on the human environment since they are not native components of ecosystems in Kansas.

European starlings. The nationwide European Starling population was estimated at 140 million (Johnson and Glahn 1994). Feare (1984) estimated the starling population in North America at 200 million. Recent data from Rich et al. (2004) estimate the population to be about 122 million breeding starlings BBS-wide. From 1966 through 2015, the number of starlings observed along routes surveyed during the BBS has shown a slightly decreasing trend in the state estimated at -0.9% annually, with a -1% decline annually from 2005 through 2015 (Sauer et al. 2017). BBS data (2005-2015) indicate a large population in Kansas. However, it must be noted that large numbers of starlings are located in urban areas and BBS routes often do not account for these populations because most BBS routes are run in areas that are more rural. Thus, BBS data are more likely to reflect the number of starlings in rural areas and not include the urban populations which would likely be the higher number. The breeding starling population in Kansas could be estimated from BBS data (Sauer et al. 2006) using corrective parameters (Rich et al. 2004) at 2.6 million, but is likely higher because BBS routes are most often conducted away from urban centers and, therefore, urban populations are missed.

Even so, with a population of 2.6 million breeding starlings, the population would increase following the nesting season. Not all starlings may breed their first year, but it was estimated that at least 66% of females did. In many populations of starlings, the males outnumber the females 2:1. Starlings lay an average of 4-6 eggs with the average being 4.28 in the Midwest and have two clutches each year below 48° latitude (Cabe 1993). Fledgling success was found to average 76.1% in New York (higher in Ontario) for both clutches with the first being about 10% more successful (Cabe 1993). Using these parameters, a breeding population of 2.6 million in Kansas would have about 575,000 breeding females that fledge 3.77 million starlings, raising the post-fledgling population to about 6.41 million starlings in Kansas. Additionally, during winter months, when the majority of BDM projects are conducted, an influx of starlings is seen in Kansas with birds migrating into the State from northern areas (band return data reflect these movements). Some starlings may leave the state, but it is likely that Kansas actually has two or three times as many starlings coming into the state during winter from migration. However, not considering the migrant population, WS-Kansas and others could potentially take about 3.7 million starlings annually without affecting the population, the borderline between moderate and high magnitude of take. WS-Kansas has averaged the take of about 34,863 starlings annually from FY15 to FY18. WS-Kansas and other agencies have no idea how many starlings are taken by private efforts to reduce damage by starlings because they are unprotected and private individuals and others can take them without a permit. Thus, resource owners suffering damage can take starlings with available BDM methods. WS-Kansas believes that other individuals or agencies might possibly take up to 250,000 starlings in control projects in Kansas, primarily with shooting and Avitrol® and Starlicide Complete®, commercially available products for certified pesticide applicators.

WS-Kansas personnel that conduct starling and blackbird damage management in feedlots, where almost all lethal control of these species is conducted, have estimated species composition at about 97% starlings, and 3% comprised of common grackles, brown-headed cowbirds, great-tailed grackles, and Brewer's blackbirds. WS-Kansas average take of 34,863 starlings (FY15-FY18) represents 1.3% of the estimated breeding population and 0.5% of the post-fledgling population. WS-Kansas take of 109,187 in FY18 represents 4% of the breeding population and this would still not be enough to cause the population to decline and would be a low magnitude of take. Therefore, WS-Kansas has determined that WS-Kansas has not added to a cumulative impact to the starling population. Take between years by WS-Kansas mostly reflects the availability of WS-Kansas to conduct projects and cooperative funding from requestors.

In addition to the above analysis, it must be reiterated that starlings are not indigenous to North America and are not protected by federal or state law. Therefore, the take of starlings by the WS-Kansas program is considered to be of no significant impact on the human environment since starlings are not an indigenous component of ecosystems in Kansas. In fact, the removal of starlings could be beneficial for many native species such as the Eastern Bluebird that declined significantly earlier this century with the spread of European Starlings across the United States as discussed in Section 1.3.7.

Feral Pigeon. The feral domestic pigeon, also known as the Rock Pigeon, is an introduced (nonnative) species in North America not protected by federal or state law. BBS data indicate that the species has experienced a nonsignificant decreasing trend in Kansas from 2005 to 2015 at -2.3%/year (Sauer et al. 2017). The breeding feral pigeon population in Kansas could be estimated from BBS data (Sauer et al. 2017) using corrective parameters (Rich et al. 2004) at 305,000. As with starlings, most BBS routes are conducted in rural areas, and, thus, BBS data most likely represent rural numbers of feral pigeons. Larger urban areas have significant numbers of feral pigeons that would not be counted. Even so, an impact analysis can be conducted with the above information, but is likely to be conservative.

Pigeons are closely associated with people where human structures and activities provide them with food and sites for roosting, loafing, and nesting (Williams and Corrigan 1994). Thus, pigeons are commonly found around city buildings, bridges, parks, farmyards, grain elevators, feed mills, and other manmade structures (Williams and Corrigan 1994). Additionally, although pigeons are primarily grain and seed eaters, they will readily feed on garbage, livestock manure, spilled grains, insects, and any other available bits of food (Williams and Corrigan 1994). In Kansas, pigeons can be found statewide throughout the year and are considered a common resident of the state.

WS-Kansas takes minimal numbers of pigeons averaging less than 4,775 annually from FY15 to FY18 (WS-Kansas takes less than 1.5% of the estimated state population). This would be a low magnitude of impact on the population.

Any BDM involving lethal control actions by WS-Kansas for this species would be restricted to isolated individual sites or communities. In those cases where feral pigeons are causing damage or are a nuisance, complete removal of the local population could be achieved. This would be considered a beneficial impact on the human environment because the affected property owner or administrator would request the action to stop or reduce damage at their site. Regional population impacts would be minor and most likely unnoticeable. Even if significant regional or nationwide reductions could be achieved, this would not be considered an adverse impact on the human environment because the species is not part of native ecosystems. However, some individuals who experience aesthetic enjoyment from watching or feeding pigeons may consider a widespread reduction in the population as a negative impact. Thus far, though, impacts from FY15 to FY18 were minimal from WS-Kansas BDM and we believe that the pigeon population in Kansas is much greater than that analyzed.

House Sparrows. Also known as English Sparrows, House Sparrows were introduced to North America from England in 1850 and spread throughout the continent (Fitzwater 1994). The species is not protected by federal or state laws. Like starlings and pigeons, House Sparrows are considered by many wildlife biologists, ornithologists, and naturalists to be an undesirable component of North American native ecosystems because they can have many negative impacts on resources and compete with native bird species. Thus, any reduction in their population would likely be considered beneficial on the human environment. House Sparrows are found in nearly every habitat except dense forest, alpine, and desert environments. It prefers human-altered habitats, and is abundant on farms and in cities and suburbs. BBS data indicate that the species has seen a significant decrease in Kansas from 2005 to 2015 at -2%/year (Sauer et al. 2017). However, the breeding population in Kansas is still abundant. The breeding House Sparrow population in Kansas could be estimated from BBS data (Sauer et al. 2017) using corrective parameters (Rich et al. 2004) at 3 million.

WS-Kansas conducts minimal BDM for House Sparrows in Kansas, averaging 10 annually and would have no impact on the species at all. Depredation permits are not required for private individuals to take them. It is expected that the public does some control of House Sparrows, but much less than starlings and pigeons. It is suspected that the public, primarily control at a few CAFOs such as dairies, takes about 50,000 House Sparrows annually, most with Avitrol®. Take would have to be in the millions in Kansas before an impact would likely start to occur. Habitat loss, primarily a decline in feeding sites and the availability of feed, over the last 60 years has been the most likely contributor to their decline (Lowther and Cink 2006).

Blackbird Population Impacts

Precise counts of blackbird populations do not exist but one estimate placed the United States summer population of the blackbird group, which includes starlings, at over 1 billion (USDA 1997) and the winter

population at over 500 million (Meanley and Royal 1976, Royall 1977). The majority of these birds occur in the eastern U.S.; for example surveys in the southeastern part of the country estimated 350 million blackbirds and starlings in winter roosts (Bookhout and White 1981). The northwest and southwest regional population of the blackbird group was estimated at 111 million (Meanley and Royall 1976). An intensive study from 1996 to 1998 in the Northern Prairie-Pothole Region (Peer et al. 2003) including areas in North and South Dakota, Minnesota, Saskatchewan, and Alberta (Figure 11) found 61 million breeding Red-winged and Yellow-headed Blackbirds, and Common Grackles (Table 8). Data from BBS indicate that the blackbird population (including with the aforementioned species, Brown-headed Cowbirds, Great-tailed Grackles, and Rusty Blackbirds) survey-wide is about 400 million and in the Central Flyway BBS Physiographic Regions (area shaded in Figure 4) is 150 million. This EA will use the population estimated in each of the physiographic areas of the Central Flyway BBS Regions (Figure 4) used to make population estimates (Appendix A) in Table 1.

Knittle et al. (1987) documented 86% of marked Red-winged Blackbirds dispersing from spring roosts in Missouri and southeastern South Dakota migrated to breeding sites in western Minnesota, North Dakota, and eastern South Dakota, and provided evidence that some Red-winged Blackbirds coming from spring roosts in the central United States breed in Canada. As part of an ongoing NWRC research project, Red-winged Blackbirds which were color marked in North Dakota in early fall were collected around Cheyenne Bottoms in Kansas later in the year. Therefore, it is probable that a majority of the blackbirds that winter in Kansas and cause damage at livestock feeding facilities are from migrating populations within the Central Flyway. However, Meanley (1971) analyzed band return data which showed that blackbirds wintering in Arkansas, Mississippi, and Louisiana in the Mississippi Flyway, and Texas in the Central Flyway came from 13, 16, 14, and 15 different states and provinces, respectively, ranging east to west from Alberta to New England and Quebec. Thus, it is probable that blackbirds wintering in Kansas come from a much broader area than just the northern Central Flyway region. This means that the mortality of blackbirds at Kansas CAFOs would not just be focused on the Northern Prairie-Pothole region but would be distributed across about 3/4 of the northern part of the United States and Canada. This factor would serve to lessen the effects of BDM-induced mortality in Kansas on the breeding population in the northern prairie region. It would also mean population impacts, including cumulative impacts as discussed herein, would be distributed across a broad segment of the North American population of blackbirds and not just for those in the Central Flyway. However, population estimates from this area will be used to determine impacts to the various populations of blackbirds because it is likely that the majority of birds come from the Central Flyway.

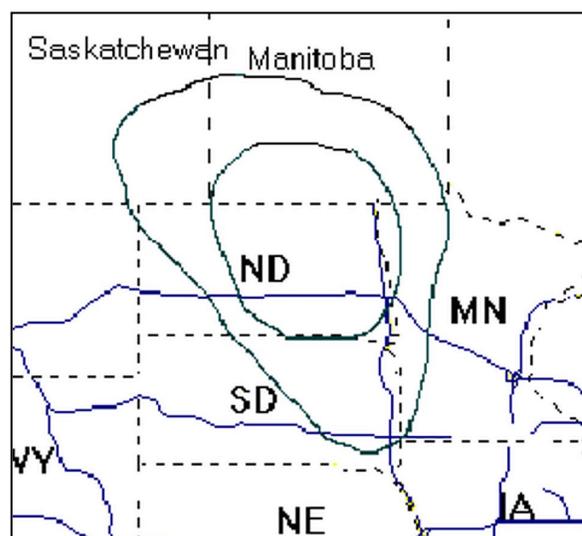


Figure 11. The Northern Prairie-Pothole region used by Peer et al. (2003) to make an estimate of the population of 3 blackbird species.

Table 8. Estimate of the breeding and fall blackbird population sizes in the Northern Prairie-Pothole region (Peer et al. 2003).

	Red-winged Blackbird	Common Grackle	Yellow-headed Blackbird
Breeding Population	27,076,061	13,069,332	11,610,860
Fall Population	39,260,288	18,950,531	16,835,747

Based on observations of WS-Kansas personnel at several affected Kansas feedlots where WS-Kansas starling and blackbird damage management operations are concentrated, the species composition of the birds causing damage has recently been estimated to be about 97% starlings, and the remaining 3% composed of Red-winged blackbirds, common grackles, brown-headed cowbirds, great-tailed grackles, and Brewer's blackbirds. The species composition of blackbird flocks, other than starlings, for this EA was estimated using BBS (Sauer et al. 2006) and CBC (NAS 2007) data. WS-Kansas lost congressional funding for starling and blackbird control and does only a few control operations at feedlots and dairies and primarily targets European starlings. WS-Kansas take of blackbird species is very minimal and would have no impact on populations and will discuss this in the following.

USFWS established a standing depredation order for use by the public to take blackbirds causing or about to cause damage. This suggests that USFWS believes that native blackbird populations are healthy enough, and the problems they cause great enough, to allow such activities. Under this "order" (50 CFR 21.43), no Federal permit is required by anyone to remove blackbirds if they are committing or about to commit depredations upon ornamental or shade trees, agricultural crops, livestock, or wildlife, or when concentrated in such numbers and manner as to constitute a health hazard or other nuisance. Thus, it appears that previous human-caused mortality or other factors have not resulted in major declines in the blackbird populations.

Red-winged Blackbird Population Impact. Red-winged Blackbirds are one of the most abundant breeding birds in North America and had the highest relative abundance between 1966 and 2015 on BBS routes (Sauer et al. 2017). BBS data (Sauer et al. 2017) show the Red-winged Blackbird population has been significantly declining in Kansas (-1.9%) and the Central BBS Region for the period 2005-2015. These declines mirror the loss of wetland nesting habitat, primarily from changing agricultural practices and development (Dolbeer 2003). The combined United States and Canadian population of Red-winged Blackbirds has been estimated at nearly 190 million birds, based on winter roost surveys (Meanley and Royall 1976) and BBS data in the 1990s (Rich et al. 2004). The Central Flyway population, south of the BBS northern limit, is estimated at 52 million which is a relative abundance of 54 birds/mi² (Appendix A: Table A1) for the Central Flyway region analyzed in this EA (Figure 4). KSWSP average take of 4 annually would have zero impact on the population.

Brown-headed Cowbird Population Impacts. Brown-headed Cowbirds are an abundant species that have been estimated to have a population of more than 90 million nationwide (Meanley and Royall 1976). More current data (Rich et al. 2004) suggest that the population is 51 million. BBS data from 2005 to 2015 show a non-significant downward trend in Kansas (-0.7%). Brown-headed Cowbirds are still one of the most abundant species on the Kansas Survey. Additionally, this is an abundant species in the Central Flyway and the population has been estimated at 20 million (Appendix A: Table A2). KSWSP take of brown-headed cowbirds occurs primarily at airports. WS-Kansas average annual take of 222 would have no impact on the population.

Common Grackle Population Impacts. Common Grackles are abundant in the Central Flyway and eastern North America which is reflected in their high relative abundance between 1966 and 2015 on BBS routes (Sauer et al. 2017). Kansas BBS data show a non-significant downward trend in the population of -1.6%/year. These downward trends are almost identical to the Brown-headed Cowbird trends. These declines are thought to have occurred as a result of habitat loss and, in some areas, the spread of the Great-tailed Grackle. Control efforts, especially in eastern United States, have been also theorized as a reason for decline (Peer and Bollinger 1997). The combined United States and Canadian population of Common Grackles has been estimated at 100 million birds, based on winter roost surveys (Meanley and Royall 1976) and 97 million based on BBS data (Rich et al. 2004). The Central Flyway population has

been estimated at 19.9 million based on the BBS physiographic regions' relative abundance in each area (Appendix A, Table A3)

Common Grackles breed as yearlings (second year). For the sake of estimating the population for this EA, it is assumed that the Common Grackle sex ratio is 1:1 males to females, 75% of the females breed laying 3-7 eggs with the average of 4.8, and have an average of 1 nest/season (Peer and Bollinger 1997). Grackles renest if their initial attempt fails. Fledgling success was found to be 49%. Using these parameters, a breeding population of 19.9 million in the Central Flyway would have about 7.5 million breeding females that successfully fledge about 17.6 million nestlings, raising the post-fledgling population to about 37.5 million Common Grackles. This would be an increase in the population by a factor of 1.9. Peer et al. (2003) used a factor of 1.45 to estimate the fall population of three blackbird species (Table 8). Thus, about 25% of the population would die from fledging to fall, presumably mostly juveniles. This would be a somewhat high mortality rate from early summer to fall, but could possibly occur. WS-Kansas take of common grackles is from BDM activities around airports and the average annual take of 44 would have no impact.

Great-tailed Grackle Population Impacts. The Great-tailed Grackle population has expanded its range in recent history, especially north and west of their historic boundaries, and has increased in abundance within its historic range. Estimated trends from 2005 to 2015 have been positive with increases ranging from 3.1% to 4.3% increase/year, but have not been significant for Kansas. Their range expansion has been credited to their adaptability to altered habitats such as urban and agricultural landscapes with irrigation (Johnson and Peer 2001). The United States population of Great-tailed Grackles has been estimated at 8 million birds, based on BBS data from the 1990s (Rich et al. 2004). More recent data for just the Central Flyway population estimated the population at 13.0 million based on the BBS physiographic regions' relative abundance in each area (Appendix A: Table A5).

Great-tailed Grackles breed as yearlings (second year). For the sake of estimating the population for this EA, it is assumed that 75% of the Great-tailed Grackle females breed, the sex ratio is 1:1 males to females, females lay 1-5 eggs with an average eggs/nest of 3.2, and an average nests/season of 1.37 (Johnson and Peer 2001). About 75% of the eggs hatch, but fledgling success was high and found to be 93% in Texas once hatched for a rate from egg to fledgling of 70% (Johnson and Peer 2001). Using these parameters, a breeding population of 13.0 million in the Central Flyway would have about 4.9 million breeding females that successfully fledge about 15.0 million nestlings, raising the post-fledgling population to about 28.0 million Great-tailed Grackles. This would be an increase in the population by a factor of 2.2.

WS-Kansas take of great-tailed grackles occurs as a result of airport BDM and the average annual take of 22 (FY15-FY18) would have no impact on this species.

Waterfowl Impacts

Many species of waterfowl have increased in numbers in the last few decades following years of decline for many. Conservation efforts over the last several decades such as closely regulating hunter harvest, slowing the loss of wetlands, and improving the quality of wetland habitat have helped reverse the decline of many waterfowl species. In response to the efforts by wildlife managers, sportsmen, conservationists, and others, waterfowl populations, particularly Canada Geese and Mallards, have flourished in recent years. As a result, some species of waterfowl are overabundant in areas where they cause damage to agricultural crops, property, and other resources, and can pose a threat to human health and safety, especially at airports. Of the 25 species that breed in the Central BBS area (including Sandhill Crane, American Coot, and Common Moorhen), only one has exhibited a significant negative trend (Mottled Duck – breeders have been reported in south-central Kansas) and 8 showed significant positive trends

from 1966 to 2005 (Sauer et al. 2006). From 1980 to 2005, 8 species again showed significant positive trends (2 new species) and no significant negative trends (Sauer et al. 2006). The Mottled Duck remained in a nonsignificant negative trend and all other species had nonsignificant positive trends. With this upward trend for most species of waterfowl, hunting seasons and bag limits in Kansas have become more liberal.

Of the waterfowl species, the most significant increase has occurred with Canada Geese (Figure 12) at 8.2% increase/year ($P < .01$) from 1966 to 2005 (Sauer et al. 2006). The establishment of Canada Goose populations has occurred throughout the United States, primarily from introduction and transplant programs (Oberheu 1973, Blandin and Heusmann 1974, Ankney 1996). These programs were very successful and Canada Geese established large “resident” populations in many urban centers in the lower 48 states, creating an increased number of conflicts between human interests and the geese (Conover and Chasko 1985, Hindman and Ferrigno 1990, Ankney 1996). WS-Kansas could potentially be involved in a project to reduce an overabundant population of “resident” Canada Geese, especially in an urban area where they are causing excessive damage or near an airport where they have the potential to cause a catastrophic incident such as that at Elmendorf Air Force Base. In 1995, a Boeing 700 AWACS jet taking off from Elmendorf Air Force Base in Alaska ingested geese into 2 engines and crashed, killing all 24 crew members and destroying the \$180 million aircraft. The removal of geese in urban areas will not have significant on their population, as it is far above its management objective in the Central Flyway, and Mississippi Flyway combined (USFWS 2006a, 2006c). USFWS identifies “resident” Canada Geese as those nesting within the lower 48 states and the District of Columbia in the months of March, April, May, or June, or residing within the lower 48 states and the District of Columbia in the months of April, May, June, July, or August (Fed. Reg. Notice 71(154):45964-45993). USFWS has provided a depredation order for Canada Geese and landowners that register with USFWS can take nests and eggs of Canada Geese to resolve or prevent injury to people, property, agricultural crops, or other interests (50 CFR 20 and 21).

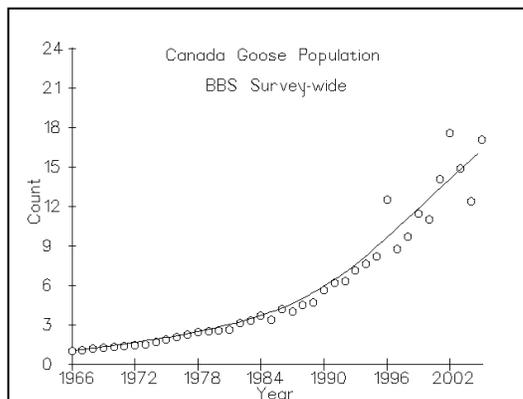


Figure 12. BBS survey-wide Canada Goose population trend (from Sauer et al. 2006).

WS-Kansas killed 6 species of waterfowl from FY15 to FY18, but has the potential of taking several others (see Appendix A). WS-Kansas primarily targets Canada geese (66 annual/average) and mallards (8 annual/average) around airports but also took 1 Snow goose, 3 Northern Shovelers, 5 Blue-winged teal, and 1 American Coot from FY15 to FY18. All of these species are common in the Central Flyway. The take of a few of these species will have no effect on their population when compared to hunting. For comparison, Kansas waterfowl hunters took an average of 95,000 Mallards and 96,000 Canada Geese during the 2016 hunting season. In the Central flyway alone, waterfowl hunters took an average of 710,000 Mallards and 600,000 Canada Geese during the 2016 hunting season (USFWS 2018a). The estimated populations in North America for these two species in 2018 surveys was over 9 million and 6 million, respectively (USFWS 2018c). Therefore, WS-Kansas concludes that none of the waterfowl take by WS-Kansas has had the potential to negatively effect the waterfowl populations and does not anticipate such. WS-Kansas could potentially have an impact on a very local level (removal of all geese from a residential pond), primarily in an urban area where Canada Geese were overabundant and agencies or organizations such as a homeowner’s association wanted them removed, but it would not effect the overall population.

Wading Bird Impacts

Twelve species of wading birds are found in Kansas (Appendix A). WS-Kansas took 5 different species of wading birds (Table 4), egrets and herons, from FY15 to FY18. WS-Kansas took an average of one or less Snowy Egret, Great Egret, Great Blue Heron, and Little Blue Heron annually from FY15 to FY18. All are fairly common in the Central BBS area during the breeding season (a few on the edge of their range in Kansas) and the take of one or less would not affect their populations. WS-Kansas did take an average of 82 Cattle Egrets from FY15 to FY18, primarily for the protection of human health and safety and aircraft at airports. These birds are native to Portugal, Spain and Africa; they first appeared in South America around the turn of the century. It is thought that cattle egrets were self-introduced to the New World, perhaps after being caught in high winds or a storm system. Since the early 1960's, the cattle egret has increased in population size and has extended its range throughout North America (Telfair 1983, 2006, Baumgartner and Baumgartner 1992). In Kansas, Cattle Egrets increased from about 0.5 birds/BBS count in 1967 to 2.2 birds/BBS count in 2015 (Sauer et al. 2017). However, trend data for Kansas is a nonsignificant positive increase during that time. Even with current control efforts, the population appears to have increased. Therefore, WS-Kansas believes that it has not had any effect on the population. Additionally, it is believed that the population in the Central Flyway is large enough to withstand the take of hundreds of thousands cattle egrets. WS-Kansas's take would be minor in comparison to the potential take.

All egrets (including cattle egrets) and herons, their nests, eggs and young are protected by the Migratory Bird Treaty Act; any form of take requires a permit from the USFWS. WS-Kansas' actual take of egrets and herons is very limited. Lethal shooting is generally used to reinforce harassment methods and is conducted at airports where there is great potential for damage to occur or in residential areas where a roost has formed. Therefore, WS-Kansas BDM activities should have no significant cumulative impact on cattle egrets or other wading birds, and no significant cumulative impacts are expected to occur.

Gull Impacts

Four species of gulls are consistently found in Kansas with most only migrating through Kansas from northern breeding grounds. Two of these, the Ring-billed Gull and Franklin's Gull, have been taken in BDM activities by WS-Kansas; from FY15 to FY18, WS-Kansas took an average of 9 and 8, respectively. Across all BBS routes in the United States, the number of Ring-billed Gulls observed has shown an increasing trend estimated at 0.99% since 1966 (Sauer et al. 2017). Between 2005 and 2015, the number of gulls observed across all routes surveyed in the United States has shown an increasing trend estimated at 6.02% annually (Sauer et al. 2017). Estimated trends from 1966 and 1980 to 2005 in the Central BBS area for Ring-billed gulls have been significant increases of 6.3%/year ($P < .01$) and 5.5%/year ($P = .01$). Survey-wide, their abundance has increased from just over 3/BBS count to just under 6/count (Sauer et al. 2006). Increases in the Ring-billed Gull population have been attributed to their ability to use supplemental food sources and increased breeding habitat (Ryder 1993). From data in the 1980s, the population was estimated at 3-4 million (Ryder 1993). For the Franklin's Gull, estimated trends from 1966 to 2015 in the Central BBS area have shown a non-significant decrease of 0.91%/year. However, in other areas their population has shown decreasing to stable trends (Burger and Gochfeld 1994). Their population BBS survey-wide (Sauer et al. 2006) has increased from about 4/count in 1966 to 40/count in 2005, a ten-fold increase. Available data reflect stable to increasing populations of gulls in the Central BBS region and, thus, it appears that the limited take from WS-Kansas and other permitted activities elsewhere, have not had a negative impact on these species populations. WS-Kansas does not anticipate taking many more gulls than were taken from FY15 to FY18, and, at most, this could potentially be up to a hundred gulls per year. It is concluded that the minor take by WS-Kansas has and will not have an effect on the gull populations and WS-Kansas does not believe that, from looking at the best available data, even the take of a few hundred gulls would cause declines in their populations.

Dove Impacts

The Mourning Dove is abundant in Kansas and a species mostly involved in BDM at airports. The Eurasian Collared-Dove, a recent invasive species, is now even more abundant than Mourning Doves, and although WS-Kansas has not taken any, will likely be a species involved in BDM at airports. Doves are smaller than pigeons, but they possess many of the same physical characteristics. They are fast-flying grayish-brown birds that usually feed on seeds or spilled grain.

Mourning Dove populations increased in the United States with the westward expansion of settlers. Recent data suggest that the breeding population of Mourning Doves is 114 million survey-wide (Rich et al. 2004) and 43 million in the Central Flyway (Appendix A, Table A10). BBS data from 1966 to 2015 and 2005 to 2015 show significant ($P<.01$) negative trends in the Central BBS area of -0.4%/year from 1966 to 2005 and -0.4%/year from 2005 to 2015 for Mourning Doves. Other BBS data for Kansas and survey-wide have shown similar declining trends or a somewhat stable population, but have not been significant. The Mourning Dove is ranked high in relative abundance on BBS routes and is among the top ten most abundant species in the United States (Mirarchi and Baskett 1994). However, as suggested by BBS trends, populations have declined in recent years likely as a result of land-use changes such as intensive, cleaner farming, removal of shelterbelts and fencerows, shifts in land use such as from agriculture to intensive forestry, grain crops to cotton, shrubland to grazing lands, or natural habitats to urban areas, and other sources of habitat loss (Mirarchi and Baskett 1994). Even so, the Mourning Dove is still abundant.

On the other hand, Eurasian Collared-Doves were introduced to the Bahamas in the 1970s and, following self-introduction into Florida, their population rapidly expanded throughout the Southeast and further. It was first recorded in Kansas by BBS observers in the late 1970s, but it was not until the late 1990s that it became more than just a novelty, increasing from a relative abundance of 3 birds/route from 1986 to 1990 to 258 birds/route from 2001 to 2004, about three times as abundant as Mourning Doves at about 84 birds/route (Sauer et al. 2006). The Eurasian collared dove population continues to increase at 37% / year in Kansas (Sauer et al. 2017). It is becoming an abundant bird in many areas and often frequents altered or man-made habitats (Romagosa 2002). WS-Kansas has taken an average of 2 Eurasian Collared-Doves from FY 15 to FY18, but anticipates that these will be taken even more frequently than Mourning Doves at airports and to resolve other damage problems. Like starlings, feral pigeons, and House Sparrows, Eurasian Collared-Doves are considered by many wildlife biologists, ornithologists, and naturalists to be an undesirable component of North American native ecosystems because they could potentially have negative impacts on resources and compete with native bird species. Thus, any reduction in their population would likely be considered beneficial on the human environment.

Doves are classified as migratory game birds that are managed by state game departments. Estimated take by sport hunters during 2014 was 485,000 birds (USFWS 2016). Most mourning dove mortality from WS-Kansas BDM activities takes place at regional airports. WS-Kansas takes, on average, about 114 doves per year from FY15 to FY18 (Table 4) much less than 0.02% of the annual harvest by hunters. Thus, WS-Kansas has had a very minor impact on dove populations in Kansas. The anticipated number of doves killed by WS-Kansas will be so low in comparison to sport hunter harvest that WS-Kansas will add to the cumulative harvest fairly insignificantly.

Wild Turkey

KSWSP took on average 8 wild turkeys from FY 2015 through FY 2018. Kansas has a large and stable wild turkey population and the take of 8 birds primarily through control work at airports would have no

impact on the statewide population. In comparison, Kansas hunters took 30,298 turkeys in the 2016 spring season alone (KDWPT 2016). Eight turkeys taken on average by KSWSP represents 0.03% of the hunter harvest.

Cliff Swallows

KSWSP took an average of 63 cliff swallows from FY 2015 to FY 2018. Cliff swallows are abundant in Kansas and the Central BBS area. BBS data indicate a significant increase of 4.6% from 1966-2015 and 7% increase in Kansas from 2005-2015 (Sauer et al. 2017). Central BBS data also reflect this increasing trend. WS-Kansas primarily takes cliff swallows at airports to protect health and human safety and to protect property in hangars and parking garages. KSWSP take of cliff swallows will have no cumulative impact on this species.

Impacts to Other Birds

WS-Kansas takes few other birds, and very few of any one species. Many of the other birds (e.g., Red-tailed Hawks, Turkey Vultures, Upland Sandpipers, Killdeer, Eastern Meadowlarks, and Horned Larks) are taken at airports where many cannot be frightened using standard hazing techniques and, therefore, are trapped or shot, sometimes to reinforce hazing, so they do not cause damage to aircraft. Raptors and shorebirds are often struck by aircraft causing serious damage to the aircraft with the potential to cause a catastrophic incident. Raptors are mostly struck while they are hunting and they do not seem to yield airspace to other birds (including aircraft) and are difficult to haze with pyrotechnics or other scare devices. WS-Kansas took an average of 3 Red-tailed Hawks, 4 Swainson's Hawks, 8 Turkey Vultures and 2 Northern Harriers from FY15 to FY18. WS-Kansas also took two non-flocking shorebirds at airports, an average of 5 Killdeer from FY15 to FY18 and one Upland Sandpipers total from FY15 to FY18. These species are common in the air operating area of an airport and are not easily hazed. Appendix A: Tables B1 and B3 lists those species with that WS-Kansas anticipates have at least the potential to be taken in BDM. It is highly unlikely that most of these other species would be taken lethally in any year as evidenced by take from FY15 to FY18. KSWSP conducts BDM at 4 airports across the state and it is concluded that the minor take by WS-Kansas has and will not have an effect on the other species' populations.

WS-Kansas did not lethally target any federally or state listed T&E species from FY15 to FY18, and does not anticipate such requests. This would only be done after obtaining the necessary permit for such an activity. WS-Kansas did take 2 listed USFWS (1995) Species of Management Concern, the Upland Sandpiper and Eastern Meadowlark, with a total of 3 and 7 taken from FY15 to FY18. Both species showed signs of declines from 2005 to 2015 in Kansas at $-0.38\%/year$ ($P=.07$) and $-2.26\%/year$ ($P<.01$) respectively (Sauer et al. 2017). The relative abundance of both species was rather high at 4.80 and 51.5 birds/count; these relative abundances, without estimates of detectability (for Eastern Meadowlark determined to be 2.38 (Rich et al. 2004) would provide estimates of 60,000 and 270,000 breeding birds in Kansas. Take by WS-Kansas would represent less than 0.01% of the breeding population and a very minor impact on the population. Thus, WS-Kansas concludes that impacts to T&E and sensitive species by WS-Kansas have been minor to nonexistent.

Impacts on Bird Populations from Nonlethal Methods in BDM

WS-Kansas hazed or captured and released (disease monitoring) or relocated at least 66 species ("Other Passerines" is as species code in the MIS for songbirds that rarely cause damage and may have been more than that one species), had the potential to cause damage, or were involved in disease monitoring from FY15 to FY18 (Table 16). Of these, 22 species were primarily hazed annually in Kansas (annually hazed >100 of a species from FY15 to FY18). However, WS-Kansas could potentially conduct nonlethal BDM

for many more species (Appendix B: Tables B1 and B3). Operationally, WS-Kansas conducts most all hazing activities at airports where birds are an aviation strike hazard. The species that cause damage in Kansas are listed in Section 1.2 with general information about them and which agency, USFWS, KPDW, or WS-Kansas has primary responsibility for responding to damage complaints that involve these species. WS-Kansas would conduct BDM for these species.

Table 16. Birds hazed (scared with frightening devices or other nonlethal method) from damage situations from FY15 to FY18 by WS-Kansas.

Species	FY15	FY16	FY17	FY18	Ave
Commensal					
European Starling*	57,321	35,865	37,307	20,809	37,825
Feral (Rock) Pigeon	671	427	1,280	1,586	991
House Sparrow	12	-	-	-	3
Blackbirds					
Red-winged Blackbird	60	90	4,745	1,630	1,631
Brown-headed Cowbird	15,200	3,270	6,215	2,000	6,671
Common Grackle	1,592	4,274	668	717	1,812
Great-tailed Grackle	160	1,508	467	329	616
Yellow-headed Blackbird	1	3	-	-	1
Waterfowl					
Canada Goose	61,098	53,363	52,591	22,588	47,410
Snow Goose	-	80	-	508	147
Greater White Fr. Goose	-	130	-	-	33
Mallard	1,089	1,479	783	367	930
Double-crested Cormorant	1,062	238	385	149	459
American White Pelican	1	-	30	-	8
Blue-winged Teal	418	874	82	221	399
Green-winged Teal	802	572	8	33	1,415
Hooded Merganser	-	174	269	37	120
Common Goldeneye	4	138	30	25	49
Gadwall	31	115	16	8	43
Northern Shoveler	-	454	1,063	20	384
American Coot	-	80	-	-	20
Bufflehead	2	-	-	30	8
Wood Duck	-	-	8	2	3
American Wigeon	-	75	-	-	19
Common Merganser	-	90	-	2	23
Scaup	-	60	38	90	47
Redhead	-	165	-	-	41
Ring-Necked	-	121	18	85	56
Ruddy	-	10	2	-	3
American Wigeon	-	75	--	-	19
Wading Birds					
Cattle Egret	381	2,868	795	1,358	1,350
Snowy Egret	28	25	21	67	35
Great Egret	24	24	20	15	21
Little Blue Heron	9	20	11	3	11
Great Blue Heron	43	29	36	9	29
Green Heron	7	-	-	1	2
Gulls					
Ring-billed Gull	9	792	395	48	311
Franklin's Gull	1,528	3,520	8,650	12,085	6,378
Bonaparte's Gull	-	-	30	-	7
Belted Kingfisher	-	-	4	-	1
Raptors					
Red-tailed Hawk	224	862	1,118	666	717
American Kestrel	229	252	190	162	208
Northern Harrier	12	656	475	343	371
Swainson's Hawk	8	165	189	15	94
Merlin	-	-	2	-	-
Cooper's Hawk	3	3	3	4	3
Broad winged Hawk	1	6	2	-	2
Red Shouldered Hawk	4	-	-	11	4
Rough-Legged Hawk	5	33	6	41	21
Sharp-Shinned Hawk	1	2	2	-	1
Mississippi Kite	23	-	35	18	19

Turkey Vulture	267	315	312	557	363
Owls, (All)	8	12	14	31	16
Shorebirds					
Killdeer	1,677	1,746	1,807	774	1,501
Upland Sandpiper	5	35	35	22	24
Least Sandpiper	-	120	162	-	71
Pectoral Sandpiper	-	10	5	-	4
Lesser Yellowlegs	-	21	58	-	20
Spotted Sandpiper	-	3	2	-	1
Semipalmated Sandpiper	5	30	-	-	9
Greater Yellowlegs	15	8	66	-	22
American Avocets	6	-	-	-	1
Miscellaneous					
American Crow	2,467	32,579	712	686	9,111
Mourning Dove	6,804	9,148	15,582	5,509	9,261
Eurasian Collared Dove	-	76	-	2	20
Cliff Swallow	2,600	6,905	-	110	2,404
Eastern Meadowlark	678	3,151	1,958	1,030	1,704
American Robin	134	320	415	111	245
Barn Swallow	315	2	162	440	919
Horned Lark	614	2,443	2,009	96	1,291
Western Meadowlark	1,552	605	379	-	634
Ring-necked Pheasant	6	5	-	-	3
Northern Flicker	23	51	13	2	22
Eastern Kingbird	23	73	90	137	81
Western Kingbird	156	911	32	212	328
House Finch	-	15	-	-	4
Eastern Phoebe	-	5	3	-	2
Scissor-tailed Flycatcher	66	172	5	6	62
Wild Turkey	175	361	274	306	279
Northern Bobwhite	14	3	18	95	33
Blue Jays	3	-	-	-	1
Nighthawks	44	16	3	2	16
Bobolinks	60	-	-	30	23

Harassment by WS-Kansas employees may negatively impact birds in the short term, especially if weather is particularly cold, because the birds are expending energy that they would otherwise not normally expend to search for food elsewhere. However, it is likely that the energy spent is not enough to cause high impacts. Birds hazed from an area such as an airport typically find alternate feeding, roosting, or loafing areas and actually benefit from being hazed. Birds hazed from an air operating area benefit from being less likely to be struck by aircraft. Birds hazed to protect crops or other resources likely benefit because removing them from damage situations probably increases the tolerance of agricultural producers and other resource owners to their presence elsewhere, which means they should be less inclined to seek political help in reducing populations through increased sport hunting or direct population management.

WS-Kansas averaged hazing about 140,684 birds annually from FY15 to FY18. WS-Kansas conducted most hazing at airports to prevent airstrikes. WS-Kansas has not conducted urban roost hazing frequently, but could with those species such as Turkey Vultures, egrets and herons, and starlings that cause human health and safety concerns. Capture and relocate programs are done for relatively few birds and involved mostly Canada Geese. WS-Kansas concludes that the nonlethal BDM activities have been beneficial in reducing damage or monitoring for disease and not created environmental concerns.

4.1.1.2 Alternative 2 - Nonlethal BDM by WS-Kansas Only.

Under this alternative, WS-Kansas would not take any target species because lethal methods would not be used. Nonlethal activities conducted by WS-Kansas would likely intensify, but result in similar levels of nonlethal activities as conducted under Alternative 1 with similar numbers of birds hazed or captured and released or relocated (Table 16). Nonlethal harassment, could be ineffective on some bird species, in particular pigeons, and some birds would quickly become habituated to harassment techniques, and, thus, where lethal techniques would be implemented to reinforce hazing efforts, WS-Kansas would continue to

conduct nonlethal control but with less success. This could be ineffective, especially at airports and for crop protection, and resource owners could become frustrated by WS-Kansas's apparent lack of success. Therefore, private entities would conduct BDM, more than under Alternative 1. Additionally, many nonlethal techniques cannot be used in certain situations (use of pyrotechnics in some residential areas to move roosts and at livestock feeding facilities such as dairies where their use can cause agitation of the livestock and loss of production). The primary difference between BDM under the current program and that conducted by private entities would be the use of chemicals and a reduced take of migratory birds requiring a depredation permit from USFWS. Private entities would rely on Avitrol[®], and potentially Starlicide Complete[®] which contains the chemical in DRC-1339, to control starlings, feral pigeons, House Sparrows, and blackbirds. DRC-1339 is currently available for use only by WS-Kansas and could not be used by the public. This would likely lead to less species being taken under this alternative with chemical BDM methods. Additionally, not all private individuals would want to obtain a depredation permit from USFWS, and, thus, less migratory birds requiring a permit would likely be taken. As a result, this alternative would likely lead to private entities having similar or less impacts to target bird species populations as described under Alternative 1. For the same reasons shown in the population impacts analysis in section 4.1.1.1, it is unlikely that starlings, feral pigeons, House Sparrows, blackbirds, Canada Geese, or other target bird populations would be impacted significantly by implementation of this alternative. Impacts and hypothetical risks of illegal chemicals and other methods under this alternative as described in Sections 2.1.3 and 2.2.3 would probably be greater than the proposed action, similar to Alternative 3, but less than Alternative 4. The use of illegal methods could potentially lead to risks to target species populations.

4.1.1.3 Alternative 3 - WS-Kansas Provides Technical Assistance Only for BDM.

Under this alternative, WS-Kansas would have no impact on any bird species population in Kansas because the program would not conduct any operational BDM activities. WS-Kansas would offer advice on the BDM techniques that could be used to resolve different damage problems. Private efforts to reduce or prevent bird damage and perceived disease transmission risks would increase under this alternative and take would be similar to, but likely less than, the proposed action which would result in similar impacts on bird populations. DRC-1339 could not be used by private individuals or entities, and thus, take with these chemicals would be nil, but other BDM methods, primarily Avitrol[®], would likely be used to make up for this loss. For the same reasons shown in the population impacts analysis in section 4.1.1.1, however, it is unlikely that starlings, feral pigeons, blackbirds, or other target bird populations would be impacted significantly by implementation of this alternative. Under this alternative, the hypothetical use of illegal methods for BDM would be high because frustrations from the inability of resources owners to reduce losses would be higher than under the proposed action because WS-Kansas would not provide assistance in many situations. The use of illegal chemicals and other methods under this alternative as described in Sections 2.1.3 could lead to real but unknown impacts on target bird populations. Impacts and hypothetical risks of illegal chemical toxicant use under this alternative would probably be more than under Alternative 2 and less than under Alternative 4.

4.1.1.4 Alternative 4 - No Federal WS-Kansas BDM.

Under this alternative, WS-Kansas would have no impact on any bird species populations in Kansas. Private efforts to reduce or prevent depredations would increase which would result in impacts on target species populations similar to those that would occur under Alternative 1. However, impacts on target species under this alternative could be the same, less, or more than those of the proposed action depending on the level of effort expended by private persons. For the same reasons shown in the population impacts analysis in section 4.1.1.1 it is unlikely that any target bird populations would be impacted significantly by implementation of this alternative. DRC-1339 is currently only available for

use by WS-Kansas employees and, therefore, take with these chemicals would be nil. Use of Avitrol® and Starlicide Complete®, which contains the same chemical that is in DRC-1339, would likely increase. Under this alternative, the hypothetical use of illegal methods for BDM would be greatest of the alternatives because frustrations from the inability of resources owners to reduce losses would be highest. The use of illegal chemicals and other methods under this alternative as described in Sections 2.1.3 could lead to real but unknown impacts on target bird populations.

4.1.2 Effects of BDM on Nontarget Species Populations, Including T&E Species

Nontarget species can be impacted by BDM whether implemented by WS-Kansas, other agencies, or the public. Impacts can range from direct take while implementing BDM methods to indirect impacts resulting from implementing BDM methods (e.g., birds entangled in netting meant only to keep them out of an area) and reduction of a bird species in a given area (positive impact on nesting song birds from the removal of brow-headed cowbirds where nest parasitism is high as discussed in Section 1.3.7). Measures are often incorporated into BDM to reduce impacts to nontarget species. KS WS takes every precaution to mitigate the possibility of a nontarget species being effected by BDM (USFWS 2015). Various factors may, at times, preclude use of certain methods, so it is important to maintain the widest possible selection of BDM tools for resolving bird damage problems. However, the BDM methods used to resolve damage must be legal and biologically sound. Often, but not always, impacts to nontarget species can be minimized. Where impacts occur, they are mostly of low magnitude in terms of nontarget species populations. Following is a discussion of the various impacts under the alternatives.

4.1.2.1 Alternative 1 - Continue the Current Federal BDM Program.

WS-Kansas did not take any nontarget species during BDM activities from FY15 to FY18. Although it was possible that some nontarget birds were unknowingly killed by use of DRC-1339 or Avitrol® for starling, blackbird, pigeon, or House Sparrow control, the method of application is designed to minimize or eliminate that risk. For example, during projects where DRC-1339 was used, the appropriate type and size of bait material was selected to be the most acceptable to the target species. The treated bait is only applied after a period of prebaiting with untreated bait material and observation in which nontarget birds are not observed coming to feed at the site. In some cases, DRC-1339 is applied on elevated stands, platforms or other restricted locations to further minimize potential impacts to ground feeding birds or any other animals. While every precaution is taken to safeguard against taking nontarget birds, at times changes in local flight patterns and other unanticipated events can result in the incidental take of unintended species. This is particularly true for bait substrates preferred by nontarget species such as rice, which is not used by WS-Kansas. However, even hazards to nontarget species with rice baits were found to be low (Cummings et al. 2003). These occurrences are rare and should not affect the overall populations of any species under the current program. WS-Kansas did not document any such occurrences from FY15 to FY18.

WS-Kansas has the potential to provide beneficial impacts to species by conducting BDM for bird species that impact other wildlife species. The take of starlings and brown-headed cowbirds, as discussed in Section 1.3.7, could be beneficial at a very local level, but as described in Section 4.1.1.1, WS-Kansas does not anticipate that populations of either species has been effected by BDM. BDM for these species would have to be focused during the nesting period when and where WS-Kansas could reduce these species breeding populations during a critical time period, for example during the nesting season of the Black-capped Vireo (if a population were found in Kansas). The take of gulls invading a nesting colony of Interior Least Terns or Snowy Plovers could also be beneficial for these species. However, it would have to be focused specifically on gulls impacting a nesting colony. WS-Kansas is not currently

conducting such activities, but WS nationally conducts many BDM projects for the benefit of other wildlife species with many successes.

T&E Species Impacts. WS-Kansas has not had an impact on any federally listed T&E or candidate species (Table 2) in Kansas, including the Whooping Crane, from FY97 to FY18. T&E species and potential impacts were discussed in Section 2.1.2 and mitigation measures to avoid T&E impacts were described in Section 3.5.2.2. The inherent safety features of most BDM methods such as DRC- 1339 has precluded or minimized hazards to listed species. A formal risk assessment was conducted on the use of DRC 1339 and other methods used in BDM and found minimal hazards to nontarget species (USDA 2018). Those measures and characteristics should assure there would be no jeopardy to T&E species or adverse impacts on mammalian or non-T&E bird scavengers from the proposed action. None of the other control methods described in the proposed action alternative pose any hazard to nontarget or T&E species. Examples of potential benefits to a listed T&E species would be the reduction of local cowbird populations which could reduce nest parasitism on the endangered black-capped vireo, or the management of birds that could directly predate on adult interior least terns, their nests, eggs or young, as discussed above.

Other sensitive species in Kansas were given in Section 2.1.2.3 and those bird species are denoted in Appendix B. Other than the sensitive species targeted during BDM, discussed in Section 4.1.1.1, WS-Kansas has not had any impacts on them from FY97 to FY18. WS-Kansas does anticipate that BDM will have more than a minor impact on any such species.

4.1.2.2 Alternative 2 - Nonlethal BDM by WS-Kansas Only.

Under this alternative, WS-Kansas would kill few nontarget animals because lethal methods would not be used. Some nonlethal BDM methods have the potential to take nontarget species such as entanglement in netting or striking a bird with a pyrotechnic projectile, but these have even a lower probability of take than BDM methods that could be used under the proposed action. However, WS-Kansas did not take any nontarget species from FY15 to FY18, and therefore, nontarget take would not differ substantially from the current program. On the other hand, individuals and organizations whose bird damage problems were not effectively resolved by nonlethal control methods alone would likely resort to other means of lethal control such as use of shooting by private persons or use of chemical toxicants. This could result in less experienced persons implementing BDM methods and could lead to greater take of nontarget wildlife than the proposed action. For example, shooting by persons not proficient at bird identification could lead to killing of nontarget birds. It is hypothetically possible that frustration caused by the inability to reduce losses could lead to illegal use of chemical toxicants which could lead to unknown impacts on local nontarget species populations, including T&E species. Hazards to raptors, including Bald Eagles and falcons, could therefore be greater under this alternative if chemicals that are less selective or that cause secondary poisoning are used by frustrated private individuals. Therefore, it is likely that nontarget take under this alternative would be greater than under the proposed action and could include T&E and sensitive species.

4.1.2.3 Alternative 3 – WS-Kansas Provides Technical Assistance Only for BDM.

Alternative 3 would not allow WS-Kansas to conduct any direct operational BDM in Kansas and, therefore, WS-Kansas would not have an impact on nontarget or T&E species. Technical assistance or self-help information would be provided at the request of producers and others. Although technical support might lead to more selective use of BDM methods by private parties than that which might occur under Alternative 2, private efforts to reduce or prevent depredations could still result in less experienced persons implementing control methods leading to greater take of nontarget wildlife than under the

proposed action. The take of nontarget species would likely be more than under Alternative 2 because WS-Kansas would not provide any operational support to resolve damage problems. It is hypothetically possible that, probably to a greater extent than under Alternative 2, frustration caused by the inability to reduce losses could lead to illegal use of chemical toxicants which could lead to unknown impacts on local nontarget species populations, including some T&E species. Hazards to raptors, including Bald Eagles, fish, aquatic species, and other nontarget species could therefore be greater under this alternative if chemicals are used by frustrated private individuals.

4.1.2.4 Alternative 4 - No Federal WS-Kansas BDM.

Alternative 4 would not allow WS-Kansas to conduct any BDM in the State. Nontarget take by WS-Kansas would be negated under this alternative. However, parties with bird damage problems would likely resort to other means of control such as use of shooting by private persons or even illegal use of chemical toxicants. There would be no impact on nontarget or T&E species by WS-Kansas BDM activities from this alternative. However, private efforts to reduce or prevent depredations could increase which could result in less experienced persons implementing BDM methods and could lead to greater take of nontarget wildlife than under the proposed action. It is hypothetically possible that frustration caused by the inability to reduce losses could lead to illegal use of chemical toxicants which could impact local nontarget species populations, including some T&E and sensitive species. Hazards to raptors, including Bald Eagles, could therefore be greater under this alternative if chemicals that are less selective or that cause secondary poisoning are used by frustrated private individuals. Under this alternative, WS-Kansas would not provide assistance with BDM and, therefore, would not have an effect on nontarget, T&E, or sensitive species. KDWP would likely provide some level of professional BDM assistance, but could be limited by resources (i.e., personnel, etc.) without federal assistance. Private efforts to reduce or prevent depredations would increase the most under this alternative. This could result in less experienced persons implementing BDM methods leading to a greater take of nontarget wildlife (potentially including T&E species) than under the current program or any of the other Alternatives. This is partially due to the lack of using specific operating policies to minimize nontarget take such as WS-Kansas's self-imposed restrictions and policies to minimize or nullify nontarget take. As described in Section 2.1.3, the hypothetical use of chemical toxicants and illegal BDM methods could impact nontarget species populations, including T&E species, under this alternative. It is, therefore, likely that more impacts to nontarget species would occur under this alternative than the current program and the other alternatives.

4.1.3 Effects of BDM on Public and Pet Safety and the Environment

The public, pets, and the environment can be impacted by BDM whether implemented by WS-Kansas, other agencies, or the public. Impacts can range from direct injury while implementing BDM methods to indirect impacts resulting from implementing BDM methods (e.g., impacts to water quality from chemicals used in BDM leaching into the system). Measures are often incorporated into BDM to minimize or nullify risks to the public, pets, and the environment. Various factors may, at times, preclude use of certain methods, so it is important to maintain the widest possible selection of BDM tools for resolving bird damage problems. However, the BDM methods used to resolve bird damage must be legal and biologically sound. Following is a discussion of the various impacts under the Alternatives.

4.1.3.1 Alternative 1 - Continue the Current Federal BDM Program.

BDM methods that might raise safety concerns include the use of firearms, pyrotechnics for hazing, traps, cage traps, and chemical repellents, toxicants, drugs, and reproductive inhibitors. WS-Kansas poses minimal threat to people, pets and the environment with BDM methods such as shooting, hazing with pyrotechnics, trapping, and use of chemicals. All firearm and pyrotechnic safety precautions are followed

by WS-Kansas when conducting BDM and WS-Kansas complies with all applicable laws and regulations governing the lawful use of firearms (USDA 2018). Shooting is used to reduce bird damage when lethal methods are determined to be appropriate. Shooting is selective for target species. Firearms are only used by WS-Kansas personnel who are experienced in handling and using them. Firearm use is very sensitive and a public concern because firearms can be misused. To ensure safe use and awareness, WS-Kansas employees who use firearms to conduct official duties “will be provided safety and handling training as prescribed in the WS Firearms Safety Manual and continuing education training on firearms safety and handling will be taken annually by all employees who use firearms.” (WS Directive 2.615). WS-Kansas Specialists who use firearms as a condition of employment, are required to certify that they meet the criteria as stated in the Lautenberg Amendment. WS-Kansas also follows safety precautions and WS Policies when using pyrotechnics. WS-Kansas uses a variety of traps for birds such as decoy cage traps. These are strategically placed to minimize exposure to the public and pets. Appropriate signs are posted on all properties where traps are set to alert the public of their presence. WS-Kansas has had no accidents involving the use of firearms, pyrotechnics or traps in which a member of the public or a pet was harmed. A formal risk assessment of WS’ operational management methods found that risks to human safety were low). Therefore, no significant impact on human safety from WS’ use of non-chemical BDM methods is expected.

WS-Kansas personnel that use avian toxicants are certified through KDA. Two toxicants are used in BDM, DRC-1339 and Avitrol®. Immobilization and euthanasia drugs are used only by WS-Kansas personnel trained and certified to use them. WS-Kansas personnel abide by WS policies and federal and state laws and regulations when using BDM methods that have potential risks (USDA WS Directive 2.401, 2.405). The same would apply to immunocontraceptives should they become registered for use in Kansas. USDA (2018) conducted a risk assessment on WS’s use of BDM methods and concluded that they had minimal hazards to the public, pets, and the environment.

DRC-1339 (3-chloro-p-toluidine hydrochloride). DRC-1339 is the primary lethal chemical BDM method that would be used under the current program alternative. WS-Kansas used an average of about 246 grams of DRC-1339 from FY15 to FY18. There has been some concern expressed by a few members of the public that unknown but significant risks to human health may exist from DRC-1339 used for BDM.

DRC-1339 is one of the most extensively researched and evaluated pesticides ever developed in the field of wildlife management. Over 30 years of studies have demonstrated the safety and efficacy of this compound. USDA (2018 Appendix Q) provides detailed information on this chemical and its use in BDM. Factors that virtually eliminate any risk of public health problems from use of this chemical are:

- Federal label and State law requires that the chemical be applied only by an individual trained and certified in its use; that the chemical be applied under strict guidelines in regard to suitable locations and bait materials to be used.
- DRC-1339 is highly unstable and degrades rapidly when exposed to sunlight, heat, or ultraviolet radiation. The half-life is about 25 hours, which means that the chemical on treated bait material generally is nearly 100% broken down within a week.
- The chemical is more than 90% metabolized in target birds within the first few hours after they ingest the bait. Therefore, little material is left in bird carcasses that may be found or retrieved by people.
- The application rates are extremely low (< 0.1 lb. of active ingredient per acre) (EPA 1995).

- People or pets would need to ingest the internal organs of birds found dead from DRC-1339 to have any chance of receiving even a minute amount of the chemical or its metabolites into his/her system. This is highly unlikely to occur for people, and pets generally could not eat enough dead birds to receive a lethal dose.
- EPA concluded that, based on mutagenicity (the tendency to cause gene mutations in cells) studies, this chemical is not a mutagen or a carcinogen (i.e., cancer-causing agent) (EPA 1995). Regardless, however, the extremely controlled and limited circumstances in which DRC-1339 is used would prevent any exposure of the public to this chemical.

The above analysis indicates that human health risks from DRC-1339 use would be virtually nonexistent under any alternative.

Avitrol® (4-Aminopyridine). Avitrol® is another chemical method that is used by WS-Kansas in BDM. WS-Kansas used no Avitrol from FY15 to FY18 but could potentially use it in the future. Although this chemical was not identified as being one of concern for human health effects, analysis of the potential for adverse effects is presented here. USDA (2018, Appendix Q) provides more detailed information on this chemical.

Avitrol® is available as a prepared grain bait mixture that is mixed in with clean bait at no greater than a 1:9 treated to untreated mixture. Recent use has been extremely limited by WS-Kansas. In addition to this factor, other factors that virtually eliminate health risks to members of the public from use of this product are:

- Federal label and State law requires that the chemical be applied only by an individual trained and certified in its use; that the chemical be applied under strict guidelines.
- It is readily broken down or metabolized into removable compounds that are excreted in urine in the target species (Extension Toxicology Network 1996). Therefore, little of the chemical remains in killed birds to present a hazard to humans.
- A human would need to ingest the internal organs of birds found dead from Avitrol® ingestion to have any chance of receiving even a minute amount of the chemical or its metabolites into his/her system. This is highly unlikely to occur. Furthermore, secondary hazard studies with mammals and birds have shown that there is virtually no hazard of secondary poisoning.
- Although Avitrol® has not been specifically tested as a cancer-causing agent, the chemical was found not to be mutagenic in bacterial organisms (EPA 1997). Therefore, the best scientific information available indicates it is not a carcinogen. Regardless, however, the extremely controlled and limited circumstances in which Avitrol® is used would prevent exposure of members of the public and pets to this chemical.

The above analysis indicates that human health risks from Avitrol® use would be virtually nonexistent under any alternative.

Other BDM Chemicals. Other nonlethal BDM chemicals that might be used or recommended by WS-Kansas include repellents such as methyl anthranilate (MA is the artificial grape flavoring used in foods and soft drinks sold for human consumption), which has been used as an area repellent and is currently being researched as a livestock feed additive, methiocarb (used in eggs),

tactile polybutene repellents, and nicrobazine (OvoControl™ G) reproductive inhibitor, Any operational use of these chemicals would be in accordance with labeling requirements under FIFRA and state pesticide laws and regulations which are established to avoid unreasonable adverse effects on the environment. Following labeling requirements and use restrictions are a built-in mitigation measure that would assure that use of registered chemical products would avoid significant adverse effects on human health.

Based on a thorough Risk Assessment, APHIS concluded that, when WS program chemical methods are used in accordance with label directions, they are highly selective to target individuals or populations, and such use has negligible impacts on the environment (USDA 2018). WS-Kansas did not have any incidents involving the public or pets conducting BDM from FY15 to FY18.

Thus, WS-Kansas poses minimal risks to public and pet health and safety when implementing BDM. In fact, WS-Kansas can reduce public safety hazards. Many WS-Kansas BDM projects have been to reduce the potential for bird strikes with aircraft at airports. Several BDM projects have been conducted to remove roosting birds such as pigeons from residential areas where the birds and their droppings are a potential disease source. Thus, this alternative would reduce threats to public health and safety by removing birds from sites where they pose a potential strike hazard to aircraft or have the potential of transmitting a disease.

4.1.3.2 Alternative 2 - Nonlethal BDM by WS-Kansas Only.

Alternative 2 would not allow for any lethal methods use by WS-Kansas. WS-Kansas would only implement nonlethal methods such as harassment with shooting firearms and pyrotechnics, live traps, repellents (e.g., methiocarb, MA, and polybutene tactile repellents), and reproductive inhibitors (nicarbazin). As discussed under Alternative 1, use of these BDM devices is not anticipated to have more than minimal risks to the public, pets, and the environment. The public is often especially concerned with the use of chemicals. The nonlethal chemicals that could be used by WS-Kansas in BDM, excluding toxicants, were discussed above and not expected to impact the public, pets, or the environment. Such chemicals must undergo rigorous testing and research to prove safety, effectiveness, and low environmental risks before they would be registered by EPA or FDA. Any operational use of chemical repellents and tranquilizer drugs would be in accordance with labeling requirements under FIFRA and state pesticide laws and regulations and FDA rules which are established to avoid unreasonable adverse effects on the environment. Following labeling requirements and use restrictions is a built-in mitigation measure that would assure that use of registered chemical products would avoid significant adverse effects on human health.

Excessive cost or ineffectiveness of nonlethal techniques could result in some individuals or entities to reject WS-Kansas's assistance and resort to lethal BDM methods. Private efforts to reduce or prevent damage would be expected to increase, resulting in less experienced persons implementing lethal BDM methods such as use of firearms and leading to greater risks than under Alternative 1. However, because some of these private parties would be receiving advice and instruction from WS, concerns about human health risks from firearms and chemical BDM methods use should be less than under Alternative 3 or 4. Commercial pest control services would be able to use Avitrol® and Starlicide Complete® (where available) and such use would likely occur more often in the absence of WS-Kansas's assistance than under Alternative 1. Use of these chemicals in accordance with label requirements should avoid any hazard to members of the public. It is hypothetically possible that frustration caused by the inability to alleviate bird damage could lead to illegal use of certain methods such as toxicants that, unlike WS-Kansas's controlled use of DRC-1339 and Avitrol®, could pose secondary poisoning hazards to pets and to mammalian and avian scavengers. Some chemicals that could be used illegally would present greater risks of adverse effects on humans than those used under the current program alternative.

4.1.3.3 Alternative 3 - WS-Kansas Provides Technical Assistance Only for BDM.

Alternative 3 would not allow any direct operational BDM assistance by WS-Kansas in the State. WS-Kansas would only provide advice and, in some cases, equipment or materials (i.e., by loan or sale) to other persons who would then conduct their own damage management actions. Concerns about human health risks from WS-Kansas implementing BDM under this alternative would be nullified. Additionally, DRC-1339 is only registered for use by WS-Kansas personnel and would not be available for use by private individuals; Starlicide Complete® may be available to private pesticide applicators in some areas. Private efforts to reduce or prevent damage would be expected to increase, resulting in less experienced persons implementing damage management methods and leading to a greater risk than the Proposed Action Alternative. However, because some of these private parties would be receiving advice and instruction from WS-Kansas, people, pets, and the environment may not be as at great a risk compared to persons using hazardous BDM methods with no instruction, similar to that discussed under Alternative 2. KDWP may provide some services and risks from BDM method use would be similar to the proposed action for projects they completed. Commercial pest control services would be able to use Avitrol® and such use would likely occur to a greater extent in the absence of WS-Kansas's assistance. Use of Avitrol® in accordance with label requirements should avoid any hazard to members of the public. It is hypothetically possible that frustration caused by the inability to alleviate bird damage, as discussed in Sections 2.1.3, could lead to illegal use of certain toxicants that, unlike WS-Kansas's controlled use of firearms, pyrotechnics, traps, and chemicals, could pose secondary poisoning hazards to pets and to mammalian and avian scavengers. Some chemicals that could be used illegally would present greater risks of adverse effects to humans and the environment, than those used under the Current Program Alternative. Therefore, risks to people, pets, and the environment would be expected to be greater under this alternative than the proposed action, but similar and possibly greater than Alternative 2. Risks, though, would be less than under Alternative 4.

4.1.3.4 Alternative 4 - No Federal WS-Kansas BDM.

Alternative 4 would not allow WS-Kansas or any other federal agency to conduct BDM in the State. Therefore, concerns about risks to people, pets, and the environment from WS-Kansas would be nullified. In addition, DRC-1339 is registered for use only for WS-Kansas personnel, would not be available for use by private individuals. KDWP possibly could provide some level of professional BDM, and their actions and associated risks would be similar to Alternative 1. Private efforts to reduce or prevent damage would be expected to increase, resulting in less experienced persons implementing BDM methods and potentially leading to greater risks to people, pets, and the environment as has been described under the alternatives. Commercial pest control services would be able to use Avitrol® and other available pesticides and requests for such use would likely occur to a greater extent in the absence of WS-Kansas's assistance. However, use of Avitrol® or other BDM chemicals in accordance with label requirements should avoid any hazard to members of the public. It is hypothetically possible that frustration caused by the inability to alleviate bird damage could lead to the use of illegal methods such as certain toxicants that could pose risks to people, pets, and the environment and these risks would likely be highest under this alternative compared to the other three. Therefore, BDM methods and their associated risks, and illegal activities would be greater under this alternative than under Alternatives 1, 2, and 3.

4.1.4 Effects of BDM on Aesthetics

Aesthetics is the philosophy dealing with the nature or appreciation of beauty. Therefore, aesthetics is truly subjective in nature and wholly dependent on what an observer regards as beautiful. On the one

hand, birds are often regarded as being aesthetic. In addition, birds can provide economic and recreational benefits (Decker and Goff 1987), and the mere knowledge that they exist is a positive benefit to many people. Wildlife populations provide a range of social and economic benefits (Decker and Goff 1987). These include direct benefits related to consumptive and non-consumptive use (i.e. wildlife-related recreation, observation, harvest, sale), indirect benefits derived from vicarious wildlife related experiences (i.e., reading, television viewing), and the personal enjoyment of knowing wildlife exists and contributes to the stability of natural ecosystems (i.e., ecological, existence, bequest values) (Bishop 1987). These positive traits of wildlife generally become incorporated into their overall aesthetic value.

On the other hand, aesthetics also includes the environment in which people live including public and private lands. The same wildlife populations that are enjoyed by many also create conflict with a number of land uses and human health and safety. The activities of some wildlife, such as starlings and blackbirds, result in economic losses to agriculture and damage to property. Human safety is jeopardized by wildlife collisions with aircraft, and wild animals may harbor diseases transmissible to humans. Damage by, or to, wildlife species that have special status, such as T&E species, is a public concern. Certain species of wildlife are regarded as nuisances in certain settings. Some people do not enjoy viewing the local environment with excessive bird excrement covering walkways, lawns and structures. These are negative values associated with birds and some of the damages they can inflict.

Public reaction is variable and mixed because there are numerous philosophical, aesthetic, and personal attitudes, values, and opinions about the best ways to manage conflicts and problems between humans and wildlife. The population management (capture and euthanasia) method provides relief from damage or threats to human health or safety to urban people who would have no relief from such damage or threats if nonlethal methods were ineffective or impractical. Many people directly affected by problems and threats to human health or safety caused by birds insist upon their removal from their property or public location when the wildlife acceptance capacity is exceeded. Some people have the view that birds should be captured and relocated to a rural area to alleviate damage or threats to human health or safety. Some people directly affected by the problems caused by birds strongly oppose the removal of the birds regardless of the amount of damage. Individuals not directly affected by the harm or damage may be supportive, neutral, or totally opposed to any removal of birds such as pigeons from specific locations or sites. Some of the totally opposed people want to teach tolerance for bird damage and threats to human health or safety, and that birds should never be captured or killed. Some of the people who oppose removal of birds do so because of human-affectionate bonds with individual birds such as pigeons or magpies. These human-affectionate bonds are similar to attitudes of a pet owner and result in aesthetic enjoyment.

Human dimensions of wildlife management include identifying how people are affected by problems or conflicts between them and wildlife, attempting to understand people's reactions, and incorporating this information into policy and management decision processes and programs (Decker and Chase 1997). Wildlife acceptance capacity is the limit of human tolerance for wildlife or the maximum number of a given species that can coexist compatibly with local human populations. Wildlife acceptance capacity is also known as the cultural carrying capacity. This primarily involves wildlife aesthetics and acceptance of their management. These terms are important in urban areas because they define the sensitivity of a local community to a specific wildlife species. For any given damage situation, there will be varying thresholds by those directly and indirectly affected by the damage. This threshold of damage is a primary limiting factor in determining the wildlife acceptance capacity. Once this wildlife acceptance capacity is met or exceeded, people will begin to implement population control methods, including capture and euthanasia, to alleviate property damage and human health or safety threats related to the accumulation of fecal droppings.

4.1.4.1 Alternative 1 - Continue the Current Federal BDM Program.

Some people who routinely view or feed individual birds such as feral domestic pigeons or urban waterfowl would likely be disturbed by removal of such birds under the current program. WS-Kansas is aware of such concerns and has taken it into consideration in some cases to mitigate them. For example, in urban situations where waterfowl are damaging resources, WS-Kansas could selectively capture the target species (coots, ducks, geese, etc.) without disturbing the other waterfowl species that are present and deemed enjoyable to the public. This strategy could also be utilized on individual birds that could be creating a damage problem. This type of consideration can help to mitigate adverse effects on local peoples' enjoyment of certain individual birds or groups of birds.

Some people have expressed opposition to the killing of any birds during BDM activities. Under the current program, lethal and nonlethal control of birds would continue and these persons would continue to be opposed. However, many persons who voice opposition have no direct connection or opportunity to view or enjoy the particular birds that would be killed by WS-Kansas's lethal control activities. Lethal control actions would generally be restricted to local sites and to small, unsubstantial percentages of overall populations. Therefore, the species subjected to limited lethal control actions would remain common and abundant and would, therefore, continue to remain available for viewing by persons with that interest.

Some people do not believe that herons and egrets, geese, or nuisance blackbird or starling roosts should even be harassed to stop or reduce damage problems. Some people who enjoy viewing birds could feel their interests are harmed by WS-Kansas's nonlethal bird harassment activities. Mitigating any such impact, however, is the fact that overall numbers of birds in the area would not be diminished by the harassment program and people who like to view these species could still do so on State wildlife management areas, National Wildlife Refuges, or on numerous private property sites where the owners are not experiencing damage to the birds and are tolerant of their presence.

Under this alternative, operational assistance in reducing nuisance pigeon and other bird problems in which droppings from the birds cause unsightly mess would improve aesthetic values of affected properties in the view of property owners and managers.

Relocation of nuisance roosting or nesting population of birds (e.g., blackbird/starling roosts, vulture roosts) by harassment can sometimes result in the birds causing the same or similar problems at the new location. If WS-Kansas is providing direct operational assistance in relocating such birds, coordination with local authorities to monitor the birds' movements is generally conducted to assure they do not reestablish at other undesirable locations.

4.1.4.2 Alternative 2 - Nonlethal BDM by WS-Kansas Only.

Under this alternative, WS-Kansas would not conduct any lethal BDM but would still conduct harassment of birds that cause damage. Some people who oppose lethal control of wildlife by government but are tolerant of government involvement in nonlethal BDM would favor this alternative. Persons who have developed affectionate bonds with individual wild birds would not be affected by WS-Kansas's activities under this alternative because the individual birds would not be killed by WS. However, other private entities would likely conduct similar BDM activities as those that would no longer be conducted by WS-Kansas which means the impacts would then be similar to the current program alternative.

Under this alternative, WS-Kansas would be restricted to nonlethal methods only. Nuisance pigeon problems would have to be resolved by nonlethal barriers and exclusion methods. Assuming property owners would choose to allow and pay for the implementation of these types of methods, this alternative

would result in nuisance pigeons and other birds relocating to other sites where they would likely cause or aggravate similar problems for other property owners. Thus, this alternative would most likely result in more property owners experiencing adverse effects on the aesthetic values of their properties than the current program alternative. Many of the current materials for used barriers (netting, metal flashing, wire, etc) could, in some cases, reduce the aesthetic property value.

4.1.4.3 Alternative 3 - WS-Kansas Provides Technical Assistance Only for BDM.

Under this alternative, WS-Kansas would not conduct any direct operational BDM but would still provide technical assistance or self-help advice to persons requesting assistance with bird damage. WS-Kansas would also not conduct any harassment of crows, egrets, herons and geese and other birds that were causing damage. Some people who oppose direct operational assistance in BDM by the government but favor government technical assistance would favor this alternative. Persons who have developed affectionate bonds with individual wild birds would not be affected by WS-Kansas activities under this alternative because the individual birds would not be killed or harassed by WS-Kansas. However, other private entities would likely conduct similar BDM activities as those that would no longer be conducted by WS-Kansas which means the impacts would then be similar to the current program alternative.

Under this alternative, the lack of operational assistance in reducing nuisance pigeon and other bird problems would mean aesthetic values of some affected properties would continue to be adversely affected but this would not occur to as great a degree as under the No Program Alternative. This is because some of these property owners would be able to resolve their problems by following WS-Kansas's technical assistance recommendations.

Relocation of nuisance roosting or nesting population of birds (e.g., blackbird/starling roosts, vulture roosts) through harassment, barriers, or habitat alteration can sometimes result in the birds causing the same problems at the new location. If WS-Kansas has only provided technical assistance to local residents or municipal authorities, coordination with local authorities to monitor the birds' movements to assure the birds do not reestablish in other undesirable locations might not be conducted. In such cases, limiting WS-Kansas to technical assistance only could result in a greater chance of adverse impacts on aesthetics of property owners at other locations than the current program alternative.

4.1.3.4 Alternative 4 - No Federal WS-Kansas BDM.

Under this alternative, WS-Kansas would not conduct any lethal removal of birds nor would the program conduct any harassment of crows, egrets, herons, geese or other birds. Persons who have developed affectionate bonds with individual wild birds would not be affected by WS-Kansas under this alternative. However, other private entities would likely conduct similar BDM activities as those that would no longer be conducted by WS-Kansas which means the impacts would then be similar to the current program alternative.

Under this alternative, the lack of any operational or technical assistance in reducing nuisance pigeon and other bird problems by WS-Kansas in which droppings from the birds cause unsightly mess would mean aesthetic values of some affected properties would continue to be adversely affected if the property owners were not able to achieve BDM some other way. In many cases, this type of aesthetic "damage" would worsen because property owners would not be able to resolve their problems and bird numbers would continue to increase.

4.2 SUMMARY AND CONCLUSION

Impacts associated with activities under consideration in this Environmental Assessment are not expected to be "significant." Based on experience, impacts of the BDM methods and strategies considered in this document are very limited in nature. The addition of those impacts to others associated with past, present, and reasonably foreseeable future actions, will not result in cumulatively significant environmental impacts. Monitoring the impacts of the program on the populations of both target and nontarget species will continue. All bird control activities that may take place will comply with relevant laws, regulations, policies, orders, and procedures, including the Endangered Species Act, Migratory Bird Treaty Act, and FIFRA. A summary of the overall effects of the BDM alternatives relative to the issues is given in Table 17. The current program alternative provides the lowest overall negative environmental consequences combined with the highest positive effects.

Table 17. A summary of the environmental consequences of each program alternative relative to each issue.

ISSUE	POTENTIAL IMPACT	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 4
Target Spp,	Non-Sensitive	0	0	0	0
	Sensitive	0	0	0	-/0
Nontarget Spp.	Non-Sensitive	0	0	0	0
	Sensitive	0/++	-/+	-/0	-/0
Risks – Adverse	People & Pets	-/0	--/0	--/0	--/0
	Environment	-/0	--/0	--/0	--/0
- Beneficial	People & Pets	++	+	+	0/+
	Aesthetics				
	Enjoyment	-	-	-	-
	Damage	++	+	+	0/+

Summary ratings for impacts are: "- -" = High Negative; "--" = Low Negative; "0" = None; "+" = Low Positive, and "++" = High positive.

Note: While a control action or removal might have a negative effect on that individual animal or issue, removing the individual bird could also have a positive effect on a T&E species.

CHAPTER 5 - LIST OF PREPARERS AND PERSONS CONSULTED

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APPENDIX A - Estimated Bird Take in Kansas and the Central Flyway by WS

Precise information on bird mortality due to WS control operations involving toxicants is not available. The MIS requires WS Specialists to record, at least, the dead birds found following a control operation which may only be a small percentage of the birds actually taken, especially for projects involving the use of DRC-1339. However, some WS State Directors or District Supervisors may require Specialists to estimate the number of birds such as starlings and blackbirds taken during a control operation. Since recording data in the MIS has been variable from one operation to the next, and one state to the next, MIS data for birds taken with toxicants cannot be used for determining total take. However, take can be estimated. This appendix provides estimates of birds taken with DRC-1339 and Avitrol® by WS in Kansas for species being analyzed at the statewide level or in the Central Flyway for the species being analyzed at the regional level.

Most bird mortality by WS operations involving toxicants in Kansas and the Central Flyway has been from the use of DRC-1339 treated baits and most of this has been for projects involving European Starlings. Glahn and Avery (2001) described methods to estimate bird mortality from using assessments of bait consumption and calculations. Homan et al. (2005) developed an empirical model based on bioenergetics for starlings at feedlots and the model predicted that 93 starlings would be killed for every pound of treated cattle ration pellet baits used (116 starlings/g DRC-1339). However, field studies testing the model found that the baits only killed an average of 67 starlings per pound used (72.5% of the “ideal” model). This would equate to 84 starlings taken for every gram of DRC-1339 used. Packham (1965) found that an average of 57 starlings were killed per pound of DRC-1339 treated french fries (a larger bait size) used at feedlots or 71 starlings taken per gram of DRC-1339. Thus, a difference exists between what models predict for results to that which actually occurs under field conditions and take with different baits. Most models predict the maximum number of target species that can be taken or the “ideal.” However, ideal conditions rarely exist in the field and take is typically only a fraction of the expected results (Glahn and Avery 2001).

Part of the problem with predicting take with DRC-1339 treated baits is that breakdown of the chemical starts relatively quickly once baits are prepared. Within hours to several days after baits are prepared and once the baits are exposed to environmental conditions (e.g., precipitation, heat, and sunlight), baits degrade, lose potency, and discolor turning dark gray which are often not selected by the target species. Thus, baits may be consumed and not be toxic (degraded) or discolored and not selected making them less effective. Additionally, baits may be made for a set number of birds seen during prebaiting operations and this number may not return when baits are placed out. Thus, baits may remain following treatments which then are disposed according to the label. The MIS system does not capture this “wastage” (bait placed in the field and not consumed, and, hence, disposed), but only the amount placed in the field. These factors (degradation, discoloration, and wastage) inherently would increase the estimated target species take using WS MIS data because all DRC-1339 used in operations is recorded whether or not it was successful. Homan et al.’s (2005) field trials, compared to the empirical model, accounted for most problems with discoloration and degradation (did not likely include precipitation because all trials had an estimated take) problems (72.5% efficacy from predicted to actual field trial take), but did not account for wastage because the amount of bait consumed was recorded for each field trial (baits placed less baits picked up after treatment). For WS-Kansas projects using DRC-1339, wastage likely averages between 10% and 25% of the baits placed. Thus, realistically the baits used that are successful in typical field conditions (from preparation to take of the target species) are probably closer to 60% of the estimated “ideal” or modeled take for the grams of DRC-1339 used, instead of the 72.5%. To conservatively estimate the number of target starlings taken for a given project, the Homan et al. (2005) field trial data multiplied by a factor of 90% to account for wastage, thus assuming wastage of 10%, or 76 taken per gram of DRC-1339 used.

Blackbirds in the family Icteridae are occasionally present in the Central Flyway and Kansas at feedlots, dairies, and other resource areas while KSWSP is conducting European Starling control. Estimated take is very different depending on the bait substrate used and method of baiting (piles or broadcast). Take would also be different for each species, as well as sex with most males weighing much more than females, based on the target species weight and daily feed consumption. Average weights for a species including females and males are 54 grams for Red-winged Blackbirds, 76 grams for Yellow-headed Blackbirds, 66 grams for Brewer's and Rusty Blackbirds, 107 for Common Grackles, 169 for Great-tailed Grackles, 157 grams for Boat-tailed Grackles (Texas only), 40 grams for Brown-headed Cowbirds, and 63 grams for Bronzed Cowbirds (Texas only). It is expected that, in order, these species would average consuming 11g, 13g, 12g, 12g, 18g, 24g, 23 g, 9g, and 12 g. DRC-1339 treated rice baits are broadcast at 10 to 20 pounds/acre. DRC-1339 treated baits for feedlots are not broadcast, but put in feeding lanes and so birds have easier access to large quantities of baits whereas more searching is required for rice baits. It is estimated that blackbirds will get 12.5% of their daily intake needs from baited sites, but it is likely that less would be obtained from areas treated with rice baits as compared to feedlots and other sites. However, wastage would be much greater (at least a third (33%), but likely closer to half (50%), as baits are broadcast requiring searching by birds which becomes more tedious as the number of baits decline) and the percentage obtaining a lethal dose much less (about 50% mortality (Cummings et al., NWRC, pers. comm. 2006, Johnston et al. 2005, Johnston et al. 2006) for birds feeding in treated fields). Field studies with rice found that birds ingested an average of about 25 rice kernels (0.5g) or about 2% to 6% of their daily intake requirements with Red-winged Blackbirds and Brown-headed Cowbirds, the species mostly targeted with treatments to protect rice, between 5% and 6%. Thus, using the current assumptions of 12.5% of the daily intake would be similar to take with rice baits (for Red-winged Blackbirds, the assumptions 100% mortality with 12.5% intake and 10% wastage results in 840 birds taken per gram of DRC-1339 vs 50% mortality with 5% intake and 42% wastage results in 820 taken per gram of DRC-1339) and used for estimating take for each species in Table 1. The take for each species is estimated for feedlot baits and rice baits in Table 1. For blackbirds, because of varying weights, Table 1 estimates the number taken with the different baits and formulations based on their daily consumption. Blackbirds move around in feedlots and fallow fields and thus get much more of their diet from non-baited areas. It is assumed that they get an eighth of their dietary needs from treated areas whereas starlings, pigeons, and House Sparrows, also discussed herein, which are much more sedentary in feedlots than blackbirds, would probably get at least 25% (likely much higher for these species). These are likely conservative estimates, but adequate for determining impacts.

Cummings et al. (unpubl data, NWRC, pers. comm. 2006) found that treated baits at feedlots would take an estimated 400 blackbirds per gram of DRC-1339 used. Table 1 estimates that take would range from 163 per gram of DRC 1339 used for "other" baits for Great-tailed Grackles to 434 for Brown-headed Cowbirds. Cummings et al. (unpubl data, NWRC, pers. comm. 2006) also found that for each pound of treated cut (1 treated : 26 untreated) rice baits placed in fields, 374 blackbirds were killed. Johnston et al. (2005) predicted that 324 red-winged blackbirds from a pound of rice baits would be killed (this number declined with the days of baiting to 285 for 5 days). These estimates would equate to 1,057 and 913 blackbirds killed per gram of DRC-1339 used. It should be noted that the first estimate included Red-winged Blackbirds and Brown-headed Cowbirds primarily and the second only Red-winged Blackbirds. Table 1 estimates that take ranges from 385 for Great-tailed Grackles to 1,027 for Brown-headed Cowbirds. It also should be noted that birds were captured following feeding in treated fields and not all birds died from the dose they received. Several birds were also collected and the number of rice grains in all birds were not enough to kill them (about 50% mortality rate for birds feeding in treated rice fields). However, their take estimates were similar to those determined in Table 1. Estimates in Table 1 included an assumed 10% wastage loss which would make the estimates very close to those found by researchers.

WS-Kansas in Kansas also targets feral pigeons with DRC-1339. WS uses whole kernel corn for these

projects, per label directions, cut at 1 treated: 5 untreated (sometimes 1:2). Pigeons have to consume at least 4 treated kernels to get a lethal dose. The standard average number of whole corn kernels in a pound is 1,300 (Ontario Corn Producer Association 2007), but this is variable depending on variety of corn (1,600 by J. Homan, NWRC Bismarck, ND, pers. comm. 2007 and 1,700 by M. Marlow, Okla. WS, pers. comm. 2007). However, lower or higher weights for kernels would not change the outcome. Assuming that 1,300 kernels equals one pound and are treated, each kernel would have about 3.5 mg DRC-1339 (prior to being cut with untreated baits). The oral LD₅₀ for pigeons is 18 mg/kg (Timm 1994, Eisemann et al. 2003). Thus it likely takes much more for 100% efficacy (acute doses for all) with pigeons, and a minimum of 20 mg/kg which for pigeons at an estimated average weight of 360 g equals 7 mg treated bait necessary to kill them or at least 2 baits. Pigeons eat about 36 gm of feed per day (British Columbia Ministry of Environment 2001) or, with whole corn, about 100 kernels (depending on weight of kernels). It is likely that when feed is put out, pigeons will consume a quarter to half their daily consumption (depending on the number of pigeons feeding, the distribution of baits, and the length of time the pigeons are exposed to the baits), or about 25 to 50 kernels. This would be enough to get a lethal dose for most birds, averaging about 4 to 8 treated baits for cut baits (1:5 ratio of treated:untreated). Assuming pigeons feed on whole kernel corn baits that have 1,300 kernels per pound and consume a third of their daily intake while baits are placed out, one pound of cut bait would take 39 pigeons (each pigeon would get an average of 6.5 treated baits). This would equate to taking 44 pigeons per gram of DRC-1339. Using a similar factor to account for wastage in field use (90%) as above, would result in a conservatively estimated 40 pigeons taken with each gram of DRC-1339 used. It should be noted that baits can be cut at 1:2 to 1:5 for pigeons depending on how much bait is required at a site for the number of pigeons present; WS-Kansas Specialists use the 1:2 treated to untreated baits for projects with very few pigeons which would decrease the number taken per gram of DRC-1339 used. However, this will be assumed to be accounted for in wastage.

Avitrol® is another toxicant sometimes used by WS-Kansas in BDM for House Sparrows, starlings, pigeons, and blackbirds in Kansas and other Central Flyway States, and comes prepackaged by the pound formulated at 0.5% 4-aminopyridine (the active ingredient) on mixed grain or corn chops. WS-Kansas then mixes the bait with the same untreated bait at 1:9. The number of birds taken with an ounce of bait depends on the species targeted, the ratio of treated to untreated baits in the formulation (WS-Kansas almost always cuts treated baits at the suggested 1:9 ratio, but this can be lowered to 1:5 for House Sparrows), and precipitation. WS-Kansas uses mostly the mixed grain bait, but also uses some corn chops. The number of grain particles per pound varies by type and size of the bait, but would likely be from 6,000 to 23,000 particles per pound for mixed grain and cracked corn. Cracked corn sifted for particle sizes between 40mg to 50mg result in about 9,000 to 12,000 particles per pound (between #5 and #7 U.S. Standard Sieves). House Sparrows eat at least 6 grams of feed per day based on kilocalorie requirements of 20 to 28Kcal/day assuming that 3.5 Kcal are produced from a gram of grain (Cabe 1993). Starlings, with a high caloric diet, eat on average 23 grams/day (Twedt 1985) and pigeons likely require about 36 grams of feed per day (British Columbia Ministry of Environment 2001). Assuming that these 3 species eat at least 25% of the necessary daily intake at one feeding before other individuals react to the Avitrol® (House Sparrows and starlings, especially, would likely stop feeding after a few individuals reacted to the chemical because of their vocalizations), that the bait is mixed at 1 treated:9 untreated which is WS-Kansas's standard application rate, and each pound of bait has 10,000 treated particles, then House Sparrows would eat about 33 particles (3 treated), starlings 127 particles (13 treated), and pigeons 198 particles (20 treated). It takes 20 minutes or more before a bird reacts to Avitrol®. Avitrol® is formulated at 0.5% which would mean that at these consumption rates, House Sparrows would get 7 mg of Avitrol®, starlings 29 mg, and pigeons 45 mg. The acute oral LD₅₀ for House Sparrows is 3.00-7.70 mg/kg and for starlings is 4.90-6.00 mg/kg. The acute oral LD₅₀ for hydrochloride salt of 4-aminopyridine for pigeons is 20 mg/kg. The oral LD₅₀ for the average weight House Sparrow would be met with 0.2 mg Avitrol®, for starling 0.5 mg, and for pigeons 7.1 mg. Therefore, all species would likely receive a toxic dose by consuming the estimated amounts. These amounts would then dictate the number

that could be taken with an ounce of Avitrol[®] treated baits (the MIS records the ounces of Avitrol[®] used and does not include the added untreated baits). Thus, it would be theoretically possible to take 189 House Sparrows, 49 starlings, and 32 pigeons. It is likely that fewer issues such as degradation and discoloration would occur with the use of Avitrol[®] because it is more stable than DRC-1339. Using 10% loss or wastage, similar factor as discussed for DRC-1339, would result in the take of 170 House Sparrows, 44 starlings, and 28 pigeons per ounce of Avitrol[®] used. Blackbird take with Avitrol[®] is given in Table 1. Take of blackbirds with Avitrol[®] ranged from 85 to 226 depending on the consumption rates of the different species.

Table 1. Estimated blackbird take with DRC-1339 and Avitrol[®] treated baits.

Species	RWBB	YHBB	BRBB	RUBB	CGRK	GTGK	BTGK	BHCB	BRCB
Spp. Ave. Weight (g)	54	76	66	66	107	169	157	40	63
Daily Ave. Consumpt.(g)	11	13	12	12	18	24	23	9	12
% Daily Ave. Cons. Eaten	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%
Wastage	10%	10%	10%	10%	10%	10%	10%	10%	10%
DRC-1339 Rice Baits									
Std g DRC Used for Bait	92	92	92	92	92	92	92	92	92
Pounds bait made	260	260	260	260	260	260	260	260	260
Lbs. bait/1 g DRC	2.83	2.83	2.83	2.83	2.83	2.83	2.83	2.83	2.83
# birds/g DRC	840	711	770	770	513	385	402	1,027	770
DRC-1339 Other Baits									
Std g DRC Used for Bait	92	92	92	92	92	92	92	92	92
Pounds bait made	110	110	110	110	100	110	110	110	110
Lbs. bait/1 g DRC	1.20	1.20	1.20	1.20	1.09	1.20	1.20	1.20	1.20
# birds/g DRC	355	300	325	325	197	163	170	434	325
Avitrol Baits									
Std. Pounds Avitrol Mixed	1	1	1	1	1	1	1	1	1
Pounds Bait Made	10	10	10	10	10	10	10	10	10
Lbs. bait/1 oz Avitrol	0.625	0.625	0.625	0.625	0.625	0.625	0.625	0.625	0.625
# birds/oz. Avitrol	185	157	170	170	113	85	89	226	170

The calculations of take can be used to estimate the number of target birds taken by WS with DRC-1339 and Avitrol[®]. However, the MIS allows WS Specialists to use a code, "Mixed Blackbirds," for sites where several species of blackbirds (starlings, blackbirds, cowbirds, and grackles) are present. Thus, species composition at operation sites also needs to be estimated where this code was used.

Starlings are the most prevalent species at feedlots. Starlings require a high protein, high calorie diet, and livestock feed such as cattle ration, pelleted feed are a great source. Unlike most blackbirds, starlings eat little grain due to their poor assimilation efficiency (turning feed into energy) for grain (Twedt 1985). Starlings prefer insects and eat them as available. As insects wane in cold weather, starlings turn to feedlots to acquire the necessary energy to survive. Thus, starlings can be found in abundance at feedlots during winter which is the case in the Great Plains states. On the other hand, blackbirds efficiently assimilate grains into energy and have more opportunity to find them in harvested and fallow fields (spillage) and rangeland (weed seeds), and, therefore, may forage more in these areas than in feedlots (Twedt 1985).

Homan (NWRC, pers. comm. 2007) stated that during his research in Kansas, starling flocks in feedlots constituted 99% or more of the birds in feedlots with few other species ever present. He also stated that a graduate student trapping birds in feedlots in the winter and spring of 2006-2007 caught no other birds besides starlings in traps. Thus, an estimate of 95% would be considered conservative for blackbird

species, but believed to be within reason for starlings.

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APPENDIX B - Bird Species of Kansas

Table 1. Common and scientific names are given for the bird species common in Kansas that have the potential of being the target of a BDM project. Many bird species in Kansas could be involved in BDM, but most species are not expected to ever be the focus of a BDM program. Most of the species could be the focus of a BDM program at an airport where they could be a strike risk. If the species causes typical requests for assistance other than BDM at airports, it is footnoted.

Species	Scientific Name
Anseriformes - Waterfowl	
Tundra Swan ²	<i>Cygnus buccinator</i>
Greater White-fronted Goose ²	<i>Anser albifrons</i>
Snow Goose ²	<i>Chen caerulescens</i>
Ross' Goose ²	<i>Chen rossii</i>
Cackling Goose ²	<i>Branta hutchinsii</i>
Canada Goose ^{2,4,5,6}	<i>Branta canadensis</i>
Wood Duck ²	<i>Aix sponsa</i>
Green-winged Teal	<i>Anas crecca</i>
American Black Duck	<i>Anas rubripes</i>
Mallard ^{2,4,5,6}	<i>Anas platyrhynchos</i>
Northern Pintail	<i>Anas acuta</i>
Blue-winged Teal	<i>Anas discors</i>
Cinnamon Teal	<i>Anas cyanoptera</i>
Northern Shoveler	<i>Anas clypeata</i>
Gadwall	<i>Anas strepera</i>
American Wigeon ⁶	<i>Anas americana</i>
Canvasback	<i>Aythya valisineria</i>
Redhead	<i>Aythya americana</i>
Ring-necked Duck ¹	<i>Aythya collaris</i>
Greater Scaup	<i>Aythya marila</i>
Lesser Scaup	<i>Aythya affinis</i>
Common Goldeneye ¹	<i>Bucephala clangula</i>
Bufflehead ¹	<i>Bucephala albeola</i>
Hooded Merganser ¹	<i>Lophodytes cucullatus</i>
Common Merganser ¹	<i>Mergus merganser</i>
Red-breasted Merganser ¹	<i>Mergus serrator</i>
Ruddy Duck	<i>Oxyura jamaicensis</i>
Order Galliformes – Pheasants, Grouse, Turkeys, and Quail	
Ring-necked Pheasant ²	<i>Phasianus colchicus</i>
Greater Prairie-Chicken	<i>Tympanuchus cupido</i>
Lesser Prairie-Chicken*	<i>Tympanuchus pallidicinctus</i>
Wild Turkey ²	<i>Meleagris gallopavo</i>
Northern Bobwhite ²	<i>Colinus virginianus</i>
Family Gavidae - Loons	
Common Loon ^{1 SMC}	<i>Gavia immer</i>
Family Podicipedidae - Grebes	
Pied-billed Grebe ¹	<i>Podilymbus podiceps</i>
Horned Grebe ¹	<i>Podiceps auritus</i>
Eared Grebe ¹	<i>Podiceps nigricollis</i>
Western Grebe ¹	<i>Aechmophorus occidentalis</i>
Clark's Grebe ¹	<i>Aechmophorus clarkii</i>
Order Pelicaniformes – Pelicans, Cormorants, and Allies	
American White Pelican ¹	<i>Pelecanus erythrorhynchos</i>

Species	Scientific Name
Double-crested Cormorant ¹	<i>Phalacrocorax auritus</i>
Order Ciconiiformes – Egrets, Herons, and Ibises	
American Bittern ^{1 SMC}	<i>Botaurus lentiginosus</i>
Least Bittern	<i>Ixobrychus exilis</i>
Great Blue Heron ¹	<i>Ardea herodias</i>
Great Egret ^{1,4,6}	<i>Casmerodius albus</i>
Snowy Egret ^{1,4,6}	<i>Egretta thula</i>
Little Blue Heron ^{1,4,6}	<i>Egretta caerulea</i>
Cattle Egret ^{1,4,6}	<i>Bubulcus ibis</i>
Green Heron ¹	<i>Butorides striatus</i>
Black-crowned Night-Heron ^{1,4,6}	<i>Nycticorax nycticorax</i>
Yellow-crowned Night-Heron ¹	<i>Nyctanassa violacea</i>
White Ibis	<i>Eudocimus albus</i>
White-faced Ibis ^{SMC}	<i>Plegadis chihi</i>
Order Falconiformes – Vultures, Hawks, and Kites	
Turkey Vulture ^{3,4,6}	<i>Cathartes aura</i>
Mississippi Kite ⁴	<i>Ictinia mississippiensis</i>
Bald Eagle*	<i>Haliaeetus leucocephalus</i>
Northern Harrier ^{SMC}	<i>Circus cyaneus</i>
Sharp-shinned Hawk ³	<i>Accipiter striatus</i>
Cooper's Hawk ³	<i>Accipiter cooperii</i>
Red-shouldered Hawk	<i>Buteo lineatus</i>
Broad-winged Hawk	<i>Buteo platypterus</i>
Swainson's Hawk	<i>Buteo swainsoni</i>
Red-tailed Hawk ³	<i>Buteo jamaicensis</i>
Ferruginous Hawk ^{SMC}	<i>Buteo regalis</i>
Rough-legged Hawk	<i>Buteo lagopus</i>
Golden Eagle ^{3 SMC}	<i>Aquila chrysaetos</i>
American Kestrel	<i>Falco sparverius</i>
Merlin	<i>Falco columbarius</i>
Prairie Falcon	<i>Falco mexicanus</i>
Peregrine Falcon **	<i>Falco peregrinus</i>
Order Gruiformes – Rails and Cranes	
Common Moorhen	<i>Gallinula chloropus</i>
American Coot ⁶	<i>Fulica americana</i>
Sandhill Crane ²	<i>Grus canadensis</i>
Whooping Crane*	<i>Grus americana</i>
Order Charadriiformes (excluding Laridae)– Shorebirds	
Black-bellied Plover	<i>Squatarola squatarola</i>
American Golden-Plover	<i>Pluvialis dominica</i>
Snowy Plover**	<i>Charadrius alexandrinus</i>
Semipalmated Plover	<i>Charadrius semipalmatus</i>
Piping Plover*	<i>Charadrius melodus</i>
Killdeer	<i>Charadrius vociferus</i>
Mountain Plover ^{SMC}	<i>Charadrius montanus</i>
Black-necked Stilt	<i>Himantopus mexicanus</i>
American Avocet	<i>Recurvirostra americana</i>
Greater Yellowlegs	<i>Tringa melanoleuca</i>
Lesser Yellowlegs	<i>Tringa flavipes</i>
Solitary Sandpiper	<i>Tringa solitaria</i>
Willet	<i>Catoptrophorus semipalmatus</i>
Spotted Sandpiper	<i>Actitis macularia</i>
Upland Sandpiper ^{SMC}	<i>Bartramia longicauda</i>
Whimbrel	<i>Numenius phaeopus</i>
Long-billed Curlew ^{SMC}	<i>Numenius americanus</i>
Hudsonian Godwit	<i>Limosa haemastica</i>
Marbled Godwit	<i>Limosa fedoa</i>
Ruddy Turnstone	<i>Arenaria interpres</i>
Red Knot	<i>Calidris canutus</i>
Sanderling	<i>Calidris alba</i>
Semipalmated Sandpiper	<i>Calidris pusilla</i>

Species	Scientific Name
Western Sandpiper	<i>Calidris mauri</i>
Least Sandpiper	<i>Calidris minutilla</i>
White-rumped Sandpiper	<i>Calidris fuscicollis</i>
Baird's Sandpiper	<i>Calidris bairdii</i>
Pectoral Sandpiper	<i>Calidris melanotos</i>
Dunlin	<i>Calidris alpina</i>
Stilt Sandpiper	<i>Calidris himantopus</i>
Buff-breasted Sandpiper	<i>Tryngites subruficollis</i>
Short-billed Dowitcher	<i>Limnodromus griseus</i>
Long-billed Dowitcher	<i>Limnodromus scolopaceus</i>
Wilson's Snipe	<i>Gallinago delicata</i>
American Woodcock	<i>Scolopax minor</i>
Wilson's Phalarope	<i>Phalaropus tricolor</i>
Red-necked Phalarope	<i>Phalaropus lobatus</i>
Family Laridae – Gulls and Terns	
Franklin's Gull ^{1,4}	<i>Larus pipixcan</i>
Bonaparte's Gull ^{1,4}	<i>Larus philadelphia</i>
Ring-billed Gull ^{1,4,6}	<i>Larus delawarensis</i>
Herring Gull ^{1,4}	<i>Larus argentatus</i>
Caspian Tern ¹	<i>Sterna caspia</i>
Common Tern ¹	<i>Sterna hirundo</i>
Forster's Tern ¹	<i>Sterna forsteri</i>
Least Tern*	<i>Sterna antillarum</i>
Black Tern ^{1 SMC}	<i>Chlidonias niger</i>
Family Columbidae – Doves and Pigeons	
Rock Pigeon ^{2,3,4,5,6}	<i>Columba livia</i>
Mourning Dove	<i>Zenaidura macroura</i>
Eurasian Collared-Dove ⁶	<i>Streptopelia decaocto</i>
Family Cuculidae – Cuckoos and Roadrunners	
Greater Roadrunner ⁵	<i>Geococcyx californianus</i>
Order Strigiformes - Owls	
Common Barn Owl ^{4,6 SMC}	<i>Tyto alba</i>
Great Horned Owl ³	<i>Bubo virginianus</i>
Burrowing Owl ^{SMC}	<i>Athene cucularia</i>
Barred Owl ³	<i>Strix varia</i>
Long-eared Owl	<i>Asio otus</i>
Short-eared Owl ^{SMC}	<i>Asio flammeus</i>
Family Caprimulgiformes - Goatsuckers	
Common Nighthawk	<i>Chordeiles minor</i>
Family Apodidae - Swifts	
Chimney Swift ^{4,6}	<i>Chaetura pelagica</i>
Family Alcedinidae - Kingfishers	
Belted Kingfisher ¹	<i>Ceryle alcyon</i>
Family Picidae - Woodpeckers	
Red-headed Woodpecker ^{2,6 SMC}	<i>Melanerpes erythrocephalus</i>
Red-bellied Woodpecker ²	<i>Melanerpes carolinus</i>
Yellow-bellied Sapsucker ^{2,6}	<i>Sphyrapicus varius</i>
Ladder-backed Woodpecker ^{2 SMC}	<i>Picoides scalaris</i>
Downy Woodpecker ²	<i>Picoides pubescens</i>
Hairy Woodpecker ²	<i>Picoides villosus</i>
Northern Flicker ^{2,6}	<i>Colaptes auratus</i>
Pileated Woodpecker ²	<i>Dryocopus pileatus</i>
Family Tyrannidae - Flycatchers	
Eastern Phoebe	<i>Sayornis phoebe</i>
Say's Phoebe	<i>Sayornis saya</i>
Great Crested Flycatcher	<i>Myiarchus crinitus</i>
Cassin's Kingbird	<i>Tyrannus vociferans</i>
Western Kingbird	<i>Tyrannus verticalis</i>
Eastern Kingbird	<i>Tyrannus tyrannus</i>
Scissor-tailed Flycatcher	<i>Tyrannus forficatus</i>
Family Alaudidae - Larks	
Horned Lark	<i>Eremophila alpestris</i>
Family Hirundinidae - Swallows	

Species	Scientific Name
Purple Martin ⁶	<i>Progne subis</i>
Tree Swallow	<i>Tachycineta bicolor</i>
Northern Rough-winged Swallow	<i>Stelgidopteryx serripennis</i>
Bank Swallow	<i>Riparia riparia</i>
Cliff Swallow ⁶	<i>Hirundo pyrrhonota</i>
Barn Swallow ^{3,6}	<i>Hirundo rustica</i>
Family Corvidae – Crows and Jays	
Blue Jay ^{2,4,6}	<i>Cyanocitta cristata</i>
Black-billed Magpie ^{2,3,4,6}	<i>Pica hudsonia</i>
American Crow ^{2,3,4,6}	<i>Corvus brachyrhynchos</i>
Fish Crow ²	<i>Corvus ossifragus</i>
Chihuahuan Raven ^{2,3,4,5,6 SMC}	<i>Corvus cryptoleucus</i>
Common Raven ^{2,3,4,5,6}	<i>Corvus corax</i>
Family Turdidae – Robins and Thrushes	
American Robin ²	<i>Turdus migratorius</i>
Family Mimidae – Mockingbirds and Thrashers	
Northern Mockingbird ⁴	<i>Mimus polyglottos</i>
Family Motacillidae - Pits	
American Pipit	<i>Anthus rubescens</i>
Sprague's Pipit ^{SMC}	<i>Anthus spragueii</i>
Family Bombycillidae - Waxwings	
Cedar Waxwing ²	<i>Bombycilla cedrorum</i>
Family Laniidae - Shrikes	
Northern Shrike	<i>Lanius excubitor</i>
Loggerhead Shrike ^{SMC}	<i>Lanius ludovicianus</i>
Family Sturnidae - Starlings	
European Starling ^{2,3,4,5,6}	<i>Sturnus vulgaris</i>
Family Fringillidae – Sparrows and Finches	
Northern Cardinal ⁴	<i>Cardinalis cardinalis</i>
Dickcissel ^{SMC}	<i>Spiza americana</i>
McCown's Longspur ^{SMC}	<i>Calcarius mccownii</i>
Lapland Longspur	<i>Calcarius lapponicus</i>
Snow Bunting	<i>Plectrophenax nivalis</i>
Bobolink ^{SMC}	<i>Dolichonyx oryzivorus</i>
Purple Finch	<i>Carpodacus purpureus</i>
House Finch ^{2,4,6}	<i>Carpodacus mexicanus</i>
American Goldfinch	<i>Carduelis tristis</i>
Family Icteridae – Blackbirds and Meadowlarks	
Red-winged Blackbird ^{2,3,6}	<i>Agelaius phoeniceus</i>
Eastern Meadowlark ^{SMC}	<i>Sturnella magna</i>
Western Meadowlark	<i>Sturnella neglecta</i>
Yellow-headed Blackbird ^{2,3}	<i>Xanthocephalus xanthocephalus</i>
Rusty Blackbird ^{2,3,6}	<i>Euphagus carolinus</i>
Brewer's Blackbird ^{2,3,6}	<i>Euphagus cyanocephalus</i>
Great-tailed Grackle ^{2,3,4,6}	<i>Quiscalus mexicanus</i>
Common Grackle ^{2,3,6}	<i>Quiscalus quiscula</i>
Brown-headed Cowbird ^{2,3,5,6}	<i>Molothrus ater</i>
Family Ploceidae – Weaver Finches	
House Sparrow ^{2,3,4,6}	<i>Passer domesticus</i>

1 = Aquaculture; 2 = Crops; 3 = Livestock and feed; 4= Human

Health and Safety; 5 = Natural resources; 6 = Property

* = Federally Listed T&E species ** = Kansas only Listed T&E spp.

SMC = Species of Management Concern (USFWS 1995)

SNC = Species in Need of Conservation (KDWP 2005)

Table 2. Common and scientific names are given for the bird species commonly occurring in Kansas that have little or no potential to be the target of a BDM project including BDM projects at airports.

Species	Scientific Name
Scaled Quail	<i>Callipepla squamata</i>
Yellow Rail ^{SMC}	<i>Coturnicops noveboracensis</i>
Black Rail ^{SMC}	<i>Laterallus jamaicensis</i>
King Rail	<i>Rallus elegans</i>
Virginia Rail	<i>Rallus limicola</i>
Sora	<i>Porzana carolina</i>
Black-billed Cuckoo	<i>Coccyzus erythrophthalmus</i>
Yellow-billed Cuckoo	<i>Coccyzus americanus</i>
Eastern Screech-Owl	<i>Otus asio</i>
Northern Saw-whet Owl	<i>Aegolius acadicus</i>
Chuck-will's-widow	<i>Caprimulgus carolinensis</i>
Whip-poor-will ^{SNC}	<i>Caprimulgus vociferus</i>
Ruby-throated Hummingbird	<i>Archilochus colubris</i>
Olive-sided Flycatcher ^{SMC}	<i>Contopus borealis</i>
Western Wood-Pewee	<i>Contopus sordidulus</i>
Eastern Wood-Pewee	<i>Contopus virens</i>
Yellow-bellied Flycatcher	<i>Empidonax flaviventris</i>
Acadian Flycatcher	<i>Empidonax virens</i>
Alder Flycatcher	<i>Empidonax alnorum</i>
Willow Flycatcher	<i>Empidonax traillii</i>
Least Flycatcher	<i>Empidonax minimus</i>
White-eyed Vireo	<i>Vireo griseus</i>
Bell's Vireo	<i>Vireo bellii</i>
Black-capped Vireo*	<i>Vireo atricapillus</i>
Blue-headed Vireo	<i>Vireo solitarius</i>
Yellow-throated Vireo	<i>Vireo flavifrons</i>
Warbling Vireo	<i>Vireo gilvus</i>
Philadelphia Vireo	<i>Vireo philadelphicus</i>
Red-eyed Vireo	<i>Vireo olivaceus</i>
Carolina Chickadee	<i>Parus carolinensis</i>
Black-capped Chickadee	<i>Parus atricapillus</i>
Tufted Titmouse	<i>Parus bicolor</i>
Red-breasted Nuthatch	<i>Sitta canadensis</i>
White-breasted Nuthatch	<i>Sitta carolinensis</i>
Brown Creeper	<i>Certhia americana</i>
Rock Wren	<i>Salpinctes obsoletus</i>
Carolina Wren	<i>Thryothorus ludovicianus</i>
Bewick's Wren ^{SMC}	<i>Thryomanes bewickii</i>
House Wren	<i>Troglodytes aedon</i>
Winter Wren	<i>Troglodytes troglodytes</i>
Sedge Wren ^{SMC}	<i>Cistothorus platensis</i>
Marsh Wren	<i>Cistothorus palustris</i>
Golden-crowned Kinglet	<i>Regulus satrapa</i>
Ruby-crowned Kinglet	<i>Regulus calendula</i>
Blue-gray Gnatcatcher	<i>Poliotila caerulea</i>
Eastern Bluebird	<i>Sialia sialis</i>
Mountain Bluebird	<i>Sialia currucoides</i>
Townsend's Solitaire	<i>Myadestes townsendi</i>
Veery ^{SMC}	<i>Catharus fuscescens</i>
Gray-cheeked Thrush	<i>Catharus mimimus</i>
Swainson's Thrush	<i>Catharus ustulatus</i>
Hermit Thrush	<i>Catharus guttatus</i>
Wood Thrush	<i>Hylocichla mustelina</i>
Gray Catbird	<i>Dumetella carolinensis</i>
Brown Thrasher	<i>Toxostoma rufum</i>
Curve-billed Thrasher ^{SNC}	<i>Toxostoma curvirostre</i>
Bohemian Waxwing	<i>Bombycilla garrulus</i>
Blue-winged Warbler	<i>Vermivora pinus</i>
Golden-winged Warbler	<i>Vermivora chrysoptera</i>
Tennessee Warbler	<i>Vermivora peregrina</i>

Orange-crowned Warbler	<i>Vermivora celata</i>
Nashville Warbler	<i>Vermivora ruficapilla</i>
Northern Parula	<i>Parula americana</i>
Yellow Warbler	<i>Dendroica petechia</i>
Chestnut-sided Warbler	<i>Dendroica pensylvanica</i>
Magnolia Warbler	<i>Dendroica magnolia</i>
Black-throated Blue Warbler	<i>Dendroica caerulescens</i>
Yellow-rumped Warbler	<i>Dendroica coronata</i>
Black-throated Green Warbler	<i>Dendroica virens</i>
Blackburnian Warbler	<i>Dendroica fusca</i>
Yellow-throated Warbler ^{SNC}	<i>Dendroica dominica</i>
Pine Warbler	<i>Dendroica pinus</i>
Prairie Warbler	<i>Dendroica discolor</i>
Palm Warbler	<i>Dendroica palmarum</i>
Bay-breasted Warbler	<i>Dendroica castanea</i>
Blackpoll Warbler	<i>Dendroica striata</i>
Cerulean Warbler ^{SMC}	<i>Dendroica cerulea</i>
Black-and-white Warbler	<i>Mniotilta varia</i>
American Redstart	<i>Setophaga ruticilla</i>
Prothonotary Warbler	<i>Protonotaria citrea</i>
Worm-eating Warbler	<i>Helmitheros vermivorus</i>
Ovenbird	<i>Seiurus aurocapillus</i>
Northern Waterthrush	<i>Seiurus noveboracensis</i>
Louisiana Waterthrush	<i>Seiurus motacilla</i>
Kentucky Warbler	<i>Oporornis formosus</i>
Mourning Warbler	<i>Oporornis philadelphia</i>
Common Yellowthroat	<i>Geothlypis trichas</i>
Hooded Warbler	<i>Wilsonia citrina</i>
Wilson's Warbler	<i>Wilsonia pusilla</i>
Canada Warbler	<i>Wilsonia canadensis</i>
Yellow-breasted Chat	<i>Icteria virens</i>
Summer Tanager	<i>Piranga rubra</i>
Scarlet Tanager	<i>Piranga olivacea</i>
Rose-breasted Grosbeak	<i>Pheucticus ludovicianus</i>
Black-headed Grosbeak	<i>Pheucticus melanocephalus</i>
Blue Grosbeak	<i>Guiraca caerulea</i>
Lazuli Bunting	<i>Passerina amoena</i>
Indigo Bunting	<i>Passerina cyanea</i>
Painted Bunting	<i>Passerina ciris</i>
Green-tailed Towhee	<i>Pipilo chlorurus</i>
Eastern Towhee	<i>Pipilo erythrophthalmus</i>
Spotted Towhee	<i>Pipilo maculatus</i>
Canyon Towhee	<i>Pipilo fuscus</i>
Cassin's Sparrow ^{SMC}	<i>Aimophila cassinii</i>
Rufous-crowned Sparrow	<i>Aimophila ruficeps</i>
American Tree Sparrow	<i>Spizella arborea</i>
Chipping Sparrow	<i>Spizella passerina</i>
Clay-colored Sparrow	<i>Spizella pallida</i>
Brewer's Sparrow ^{SMC}	<i>Spizella breweri</i>
Field Sparrow	<i>Spizella pusilla</i>
Black-chinned Sparrow	<i>Spizella atrogularis</i>
Vesper Sparrow	<i>Poocetes gramineus</i>
Lark Sparrow	<i>Chondestes grammacus</i>
Lark Bunting ^{SMC}	<i>Calamospiza melanocorys</i>
Savannah Sparrow	<i>Passerculus sandwichensis</i>
Baird's Sparrow ^{SMC}	<i>Ammodramus bairdii</i>
Grasshopper Sparrow ^{SMC}	<i>Ammodramus savannarum</i>
Henslow's Sparrow ^{SMC}	<i>Ammodramus henslowii</i>
Le Conte's Sparrow	<i>Ammodramus leconteii</i>
Nelson's Sharp-tailed Sparrow	<i>Ammodramus nelsoni</i>
Fox Sparrow	<i>Passerella iliaca</i>
Song Sparrow	<i>Melospiza melodia</i>
Lincoln's Sparrow	<i>Melospiza lincolni</i>
Swamp Sparrow	<i>Melospiza georgiana</i>
White-throated Sparrow	<i>Zonotrichia albicollis</i>
White-crowned Sparrow	<i>Zonotrichia leucophrys</i>
Harris' Sparrow	<i>Zonotrichia querula</i>
Dark-eyed Junco	<i>Junco hyemalis</i>
Smith's Longspur	<i>Calcarius pictus</i>

Chestnut-collared Longspur ^{SMC}	<i>Calcarius ornatus</i>
Orchard Oriole	<i>Icterus spurius</i>
Baltimore Oriole	<i>Icterus galbula</i>
Bullock's Oriole	<i>Icterus bullockii</i>
Red Crossbill	<i>Loxia curvirostra</i>
Pine Siskin	<i>Carduelis pinus</i>
Evening Grosbeak	<i>Coccothraustes vespertinus</i>

* = Federally Listed T&E species

SMC = Species of Management Concern (USFWS 1995)

SNC = Species in Need of Conservation (KDWP 2005)

Table 3. Common and scientific names are given for the bird species that have been infrequently or accidentally seen in Kansas. Also included are species that hypothetically (H) could be seen in Kansas. Some of these species have the potential of being the focus of a BDM project. Shaded species will not be or are not likely to be involved in a BDM project. All of these species are not discussed in the EA because they occur so infrequently that it is highly unlikely in any given span of years that these would be the focus of a single BDM project. These are given to let the reader know that WS is aware of the other species potentially present in Kansas. Shaded species are not likely to ever be the focus of a BDM project.

Species	Scientific Name
Red-throated loon	<i>Gavia stellata</i>
Pacific Loon	<i>Gavia pacifica</i>
Yellow-billed Loon	<i>Gavia adamsii</i>
Red-necked Grebe	<i>Podiceps ariseaena</i>
Brown Pelican*	<i>Pelecanus occidentalis</i>
Neotropic Cormorant	<i>Phalacrocorax brasilianus</i>
Anhinga	<i>Anhinga anhinga</i>
Magnificent Frigatebird	<i>Fregata magnificens</i>
Tricolored Heron	<i>Egretta tricolor</i>
Reddish Egret	<i>Egretta rufescens</i>
Glossy Ibis	<i>Plegadis falcinellus</i>
Roseate Spoonbill	<i>Aiaia aiaia</i>
Wood Stork	<i>Mycteria americana</i>
Greater Flamingo	<i>Phoenicopterus ruber</i>
Fulvous Whistling-Duck	<i>Dendrocyana bicolor</i>
Black-bellied Whistling-Duck	<i>Dendrocyana autumnalis</i>
Trumpeter Swan ^{SMC}	<i>Cygnus buccinator</i>
Brant	<i>Branta bernicla</i>
Mottled Duck	<i>Anas fulviquila</i>
Garganey	<i>Anas querquedula</i>
Eurasian Wigeon (H)	<i>Anas penelope</i>
Tufted Duck (H)	<i>Aythya fulviquila</i>
King Eider	<i>Somateria spectabilis</i>
Common Eider	<i>Somateria mollissima</i>
Harlequin Duck	<i>Histrionicus histrionicus</i>
Barrow's Goldeneye	<i>Bucephala islandica</i>
Long-tailed Duck	<i>Clanquula hyemalis</i>
Black Scoter	<i>Melanitta nigra</i>
Surf Scoter	<i>Melanitta perspicillata</i>
White-winged Scoter	<i>Melanitta fusca</i>
Black Vulture	<i>Coragyps atratus</i>
Osprey	<i>Pandion haliaetus</i>

Species	Scientific Name
Swallow-tailed Kite	<i>Elanoides forficatus</i>
White-tailed Kite	<i>Elanus leucurus</i>
Northern Goshawk ^{SMC}	<i>Accipiter gentilis</i>
Harris' Hawk	<i>Parabuteo unicinctus</i>
Gray Hawk (H)	<i>Buteo nitidus</i>
Gyr Falcon	<i>Falco rusticolus</i>
Ruffed Grouse	<i>Bonasa umbellus</i>
Sharp-tailed Grouse	<i>Tympanuchus phasianellus</i>
Purple Gallinule	<i>Porphyryla martinica</i>
Wilson's Plover (H)	<i>Charadrius wilsonia</i>
Spotted Redshank	<i>Tringa erythropus</i>
Eskimo Curlew*	<i>Numenius borealis</i>
Curlew Sandpiper	<i>Calidris ferruginea</i>
Ruff	<i>Philomachus pugnax</i>
Red Phalarope	<i>Phalaropus fulicaria</i>
Pomarine Jaeger	<i>Stercorarius pomarinus</i>
Parasitic Jaeger	<i>Stercorarius parasiticus</i>
Long-tailed Jaeger	<i>Stercorarius longicaudus</i>
Laughing Gull	<i>Larus atricilla</i>
Little Gull	<i>Larus minutus</i>
Black-headed Gull	<i>Larus ridibundus</i>
Mew Gull	<i>Larus canus</i>
California Gull	<i>Larus californicus</i>
Thayer's Gull	<i>Larus thayeri</i>
Iceland Gull	<i>Larus glaucooides</i>
Lesser Black-backed Gull	<i>Larus fuscus</i>
Glaucous-winged Gull (H)	<i>Larus glaucescens</i>
Glaucous Gull	<i>Larus hyperboreus</i>
Great Black-backed Gull	<i>Larus marinus</i>
Black-legged Kittiwake	<i>Rissa tridactyla</i>
Sabine's Gull	<i>Xema sabini</i>
Gull-billed Tern	<i>Sterna nilotica</i>
Arctic Tern (H)	<i>Sterna paradisaea</i>
Black Skimmer	<i>Rhynchops niger</i>
Long-billed Murrelet (H)	<i>Brachyramphus pardix</i>
Band-tailed Pigeon	<i>Columba fasciata</i>
White-winged Dove	<i>Zenaida asiatica</i>
Inca Dove	<i>Scardafella inca</i>
Common Ground-Dove	<i>Columbina passerina</i>
Groove-billed Ani	<i>Crotophaga sulcirostris</i>
Flammulated Owl (H)	<i>Otus flammeolus</i>
Western Screech-Owl	<i>Otus kennicottii</i>
Snowy Owl	<i>Nyctea scandiaca</i>
Lesser Nighthawk	<i>Chordeiles acutipennis</i>
Common Poorwill	<i>Phalaenoptilus nuttallii</i>
White-throated Swift	<i>Aeronautes saxatilis</i>
Magnificent Hummingbird	<i>Eugenes fulgens</i>
Black-chinned Hummingbird	<i>Archilochus alexandri</i>
Broad-billed Hummingbird	<i>Cynanthus latirostris</i>
Costa's Hummingbird	<i>Calypte costae</i>
Anna's Hummingbird	<i>Calypte anna</i>
Calliope Hummingbird	<i>Stellula calliope</i>
Broad-tailed Hummingbird	<i>Selasphorus platycercus</i>
Rufous Hummingbird	<i>Selasphorus rufus</i>
Allen's Hummingbird	<i>Selasphorus sasin</i>
Lewis' Woodpecker	<i>Melanerpes lewis</i>
Red-naped Sapsucker	<i>Sphyrapicus nuchalis</i>
Williamson's Sapsucker	<i>Sphyrapicus thyroideus</i>
Hammond's Flycatcher	<i>Empidonax hammondi</i>
Dusky Flycatcher	<i>Empidonax oberholseri</i>
Gray Flycatcher ^{SMC}	<i>Empidonax wrightii</i>
Cordilleran Flycatcher	<i>Empidonax occidentalis</i>
Black Phoebe (H)	<i>Sayornis nigricans</i>
Eastern Phoebe	<i>Sayornis phoebe</i>
Vermillion Flycatcher	<i>Pyrocephalus rubinus</i>
Ash-throated Flycatcher	<i>Myiarchus cinerascens</i>
Great Kiskadee	<i>Pitangus sulphuratus</i>
Fork-tailed Flycatcher (H)	<i>Tyrannus savana</i>
Violet-green Swallow	<i>Tachycineta thalassina</i>
Cave Swallow	<i>Hirundofulva</i>

Species	Scientific Name
Steller's Jay	<i>Cyanocitta stelleri</i>
Western Scrub Jay	<i>Aphelocoma californica</i>
Mexican Jay	<i>Aphelocoma ultramarina</i>
Pinyon Jay	<i>Gymnorhinus cyanocephalus</i>
Clark's Nutcracker	<i>Nucifraga columbiana</i>
Mountain Chickadee	<i>Parus gambeli</i>
Juniper Titmouse (H)	<i>Parus ridgwayi</i>
Bushtit	<i>Psaltriparus minimus</i>
Pygmy Nuthatch	<i>Sitta pygmaea</i>
Brown-headed Nuthatch	<i>Sitta pusilla</i>
Canyon Wren	<i>Catherpes mexicanus</i>
Northern Wheatear (H)	<i>Oenanthe oenanthe</i>
Western Bluebird (H)	<i>Sialia mexicana</i>
Varied Thrush	<i>Ixoreus naevius</i>
Sage Thrasher	<i>Oreoscoptes montanus</i>
Phainopepla	<i>Phainopepla nitens</i>
Gray Vireo ^{SMC}	<i>Vireo vicinior</i>
Plumbeous Vireo	<i>Vireo plumbeus</i>
Cassin's Vireo	<i>Vireo cassinii</i>
Virginia's Warbler ^{SMC}	<i>Vermivora virginiae</i>
Cape May Warbler	<i>Dendroica tigrini</i>
Black-throated Gray Warbler	<i>Dendroica nigrescens</i>
Townsend's Warbler	<i>Dendroica townsendi</i>

Species	Scientific Name
Hermit Warbler	<i>Dendroica occidentalis</i>
Swainson's Warbler	<i>Limnothylops swainsonii</i>
Connecticut Warbler	<i>Oporornis agilis</i>
MacGillivray's Warbler	<i>Oporornis tolmiei</i>
Painted Redstart	<i>Myioborus pictus</i>
Western Tanager	<i>Piranga ludoviciana</i>
Bachman's Sparrow	<i>Aimophila aestivalis</i>
Black-throated Sparrow	<i>Amphispiza bilineata</i>
Sage Sparrow	<i>Amphispiza belli</i>
Golden-crowned Sparrow	<i>Zonotrichia atricapilla</i>
Pyrrhuloxia	<i>Cardinalis sinuatus</i>
Scott's Oriole	<i>Icterus parisorum</i>
Brambling	<i>Fringilla montifringilla</i>
Pine Grosbeak	<i>Pinicola enucleator</i>
White-winged Crossbill	<i>Loxia leucoptera</i>
Common Redpoll	<i>Carduelis flammea</i>
Lesser Goldfinch	<i>Carduelis psaltria</i>
Shiny Cowbird (H)	<i>Molothrus bonariensis</i>

* = Federally Listed T&E species

SMC = Species of Management Concern (USFWS 1995)