ENVIRONMENTAL ASSESSMENT

BIRD DAMAGE MANAGEMENT IN NEBRASKA

Prepared By:

United States Department of Agriculture
Animal and Plant Health Inspection Service
Nebraska 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
NASS	Nebraska Agricultural Statistics Service
NDA	Nebraska Department of Agriculture
NGPC	Nebraska Game and Parks Commission
NSA	Nebraska Statutes Annotated
WS-Nebraska	Nebraska 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
P	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 Nebraska, can periodically come into conflict with human interests 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 under the Acts of March 2, 1931, as amended, and December 22, 1987, 7 U.S.C. §§ 8351-8353 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 the alternatives that this responsibility can be carried out to resolve conflicts with bird species in Nebraska. Bird damage management (BDM) is an important function of the Nebraska WS Program (WS-Nebraska). Appendix B lists all bird species that have been found in Nebraska with Table B1 listing those species that have the highest probability of coming into conflict with people in Nebraska or being part of disease surveillance projects.

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

APHIS-WS has the federal statutory authority under the Acts of March 2, 1931, as amended, and December 22, 1987, 7 U.S.C. §§ 8351-8353 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 service's 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 service's 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-Nebraska activities in Nebraska to manage damage caused by bird species or species groups. WS-Nebraska BDM activities are conducted to protect human health at airports, reduce disease threats from birds, and reduce damage to 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. Nebraska has 337 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 Nebraska but are outside of the species' normal range some of these species are seen annually and a few may even nest, but not in any abundance or regularity. Of the regular residents, 114 (not including T&E species) will be the focus of WS-Nebraska BDM. Of these, 88 species could be targeted to protect natural resources. The species that this EA will address are those that are normally found in Nebraska and cause problems and are listed below and in Appendix B. The primary species that WS-Nebraska receives requests for assistance include European Starling[1] (*Sturnus vulgaris)*, Red-winged Blackbird (*Agelaius phoeniceus*), Common Grackle (*Quiscalus quiscula*), Brown-headed Cowbird (*Molothrus ater*), American Crow (*Corvus brachyrhynchos*), Double-crested Cormorant (*Phalacrocorax auritus*), American White Pelican (*Pelecanus erythrorhynchos*), Mourning Dove (*Zenaida macroura*), Eurasian CollaredDove (*Streptopelia decacto),* Ring-necked Pheasant[8] (*Phasianus colchicus*), American Coot (*Fulica americana*), Mallard (domestic/wild) (*Anas platyrhynchos*), Gadwall (*A. strepera),* Northern Shoveler (*A. clypeata),* Northern Pintail (*A. acuta),* Green-winged Teal (*A. crecca),* Blue-winged Teal (*A. discors*), Wood Duck (*Aix sponsa),* Common Goldeneye (*Bucephala clangula*), Common Merganser (*Mergus merganser*), Hooded Merganser *(Lophodytes cucullatus*), Red-breasted Merganser (*Mergus serrator*), Redhead (*Aythya Americana*), Ring-necked Duck (*Aythya collaris*), Ruddy Duck (*Oxyura jamaicensis*), Lesser Scaup (*Aythya affinis*), American Wigeon (*Mareca Americana*), Bufflehead (*Bucephala albeola*), Canada Goose (*Branta canadensis),* Snow Goose (*Anser caerulescens*), Greater White-fronted Goose (*Anser albirons*), Trumpeter Swan (*Cygnus buccinator*), Bald Eagle (*Haliaeetus leucocephalus*), Osprey (*Pandion haliaetus*), American Kestrel (*Falco sparverius*), Merlin (*Falco rusticolus*), Peregrine Falcon (*Falco peregrinus*), Cooper's Hawk (*Accipiter cooperii*), Sharp-shinned Hawk (*A. striatus),* Red-tailed Hawk (*Buteo jamaicensis*), Swainson's Hawk (*B. swainsoni),* Northern Harrier (*Circus cyaneus),* Rough-legged Hawk (*Buteo lagopus*) Short-eared Owl (*Asio flammeus),* Great horned Owl (*Bubo virginianus*), Barred Owl (*Strix varia*), Burrowing Owl (*Athene cunicularia*), Common Nighthawk (*Chordeiles minor),* Franklin's Gull (*Larus pipixcan),* Ring-billed Gull (*L. delawarensis*), Bonaparte's gull (*Chroicocephalus philadelphia*), Herring Gull (*Larus argentatus*), Least Tern (*Stemula antillarum*), Black Tern (*Chlidonias niger*), Common Tern (*Stema hirundo*), Great Blue Heron (*Ardea herodias),* Green Heron (*Butorides virescens*), Cattle Egret (*Bubulcus ibis),* Killdeer (*Charadrius vociferous*), American Golden-Plover (*Pluvialis dominica*), Pied-billed Grebe (*Podilymbus podiceps),* Eared Grebe (*Pociceps auratus*), Upland Sandpiper (*Bartramia longicauda),* Least Sandpiper *(Calidris minutilla*), Greater Yellowlegs (*Tringa melanoleuca*), Lesser Yellowlegs (*Tringa favipes*), Wilson's Phalarope (*Phalaropus tricolor*), White-faced Ibis (*Plegadis chihi*), Eastern Meadowlark (*Sturnella magna),* Western Meadowlark (*S. neglecta*), Horned Lark (*Eremophila alpestris*), Rock Dove[3] (feral pigeon) (*Columba livia*), American Robin (*Turdus migratorius*), House Sparrow[3] (*Passer domesticus*), Barn Swallow (*Hirundo rustica*), Cliff Swallow (*H. pyrrhonota*), Tree Swallow (*Tachycineta bicolor*), Purple Martin (*Progne subis*), Chimney Swift (*Chaetura pelagica*), Belted Kingfisher (*Megaceryle alcyon*), Western Kingbird (*Tyrannus verticalis*), Eastern Kingbird (*Tyrannus tyrannus*), Northern Flicker (*Colaptes auratus*), Downy Woodpecker (*Picoides pubescens*), Hairy Woodpecker (*Dryobbates villosus*), Wild Turkey[2] (*Meleagris gallopavo*), Turkey Vulture

[1] It should be noted that Starlings, House sparrows and Pigeons are considered non-indigenous, invasive species, and because of their negative impacts and competition with native birds, are considered by many wildlife biologists and ornithologists to be an undesirable component of North American wild and native ecosystems. These three species are not protected by MBTA or state law. Any population reduction of these species in North America could be considered beneficial to native bird species.

[2] Ring-necked pheasants and wild turkeys are managed by the state and not protected by MBTA.

(*Cathartes aura*), and feral, domestic and exotic birds. Several other species cause minor, but potentially locally serious, problems mostly at airports. All these species or their groups will be discussed in Section 2.2.1. However, WS-Nebraska may conduct BDM for any bird species in Nebraska when permitted by the USFWS.

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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, 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-Nebraska initially developed the issues and alternatives associated with BDM in put from the USFWS and the Nebraska Game and Parks Commission (NGPC). The USFWS has the overall regulatory authority of migratory bird species, while NGPC has the authority to manage wildlife populations in the State of Nebraska. To assist with identifying additional issues and alternatives to BDM, WS-Nebraska will make this EA available to the public for review and comment prior to the issuance of a Decision[3].

WS has previously developed an EA that analyzed the need for action to manage damage associated with several bird species in Nebraska. 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 Nebraska Bird Management EA and FONSI.

This EA will assist in determining if the proposed management of damage associated with birds could have a significant impact on the quality of the human environment. This EA will analyze four 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 NGPC, 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 Nebraska to facilitate planning and interagency coordination, to streamline program management, and to involve the public and obtain their input through comments and feedback. WS-Nebraska also made the EA available to the public for review and comment through notices published in local media and through direct notification of interested parties. WS-Nebraska made the EA available to the public for review and comment by a legal notice published in the *Lincoln Journal Star*, on the APHIS website on September 22, 2020 and on the federal e-rulemaking portal at the regulations.gov website beginning on September 21, 2020. WS also sent a notice of availability directly to agencies, stakeholders, organizations, and individuals with probable interest

[3]After 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.

in BDM in the state through the gov. delivery portal on September 22, 2020. The opportunity for public comment closed on November 6, 2020.

During the public comment period, WS-Nebraska only received four comment submissions on regulations.gov, none of which contained any information that warranted changes to the EA. Comments that are individual opinions or comments 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 and aviation. From federal fiscal year 2015 (FY15) to federal fiscal year 2019 (FY19) WS-Nebrask 1,823 requests for assistance for BDM, 132 for agriculture (including aquaculture), and 1,072 for human health and safety, 484 for property, and 135 for natural resources. This information is kept in the MIS[1]. Requests for assistance are an indication of need, but the requests that WS-Nebraska receives likely represent only a portion of the need. Therefore, WS-Nebraska loss reports do not actually reflect the total value of bird damage in Nebraska but provides an indicator of the annual losses. Also, some people are unaware of the WS-Nebraska and may try to resolve problems themselves without requesting WS-Nebraska assistance.

1.3.1 Summary of Proposed Action

The proposed action is to continue the current portion of the WS program in Nebraska that responds to requests for BDM to protect aviation, 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 Nebraska.

A major component of WS-Nebraska 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-Nebraska 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-Nebraska 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-Nebraska would include shooting, trapping, egg addling/destruction, DRC-1339, Avitrol®, and live capture by trapping. Nonlethal methods used by WS-Nebraska may include wire barriers and deterrents such as porcupine wire, netting, and fencing,

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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.

WS-Nebraska may conduct BDM anywhere in the State on public or private property, when there is a request for assistance and WID is completed. 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 trypansomiasis and toxoplasmosis; and rickettsial/chlamydial diseases such as chlamydiosis and Q fever (Figure 1). As many as 29 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-Nebraska.

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 *Crpytosporidium parvum*, *Giardia lambia*, 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			
erysipeloid	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,	causes middle ear infection in swine, dogs, and cats

		cryptococcosis	
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 trypansomiasis	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 FY19, Nebraska aviation officials reported 581 bird strikes statewide. (FAA National Wildlife Strike Database 2019).

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 (FAA National Wildlife Strike Database 2019). 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 Nebraska are:

Lincoln airport

11/21/2017 damaged caused by a Snow Goose to a privately-owned BE-58 Baron - “Strike occurred at night while descending 5000 feet into LNK. Obliterated the windshield and struck Pilot in the head. Emercency landing LNK. Pilot taken by ambulance to hospital for treatment of Lacerations. Significant structural damage to the exterior and interior of the plane.”

Omaha airport

11/27/2015 damaged caused by a Sonw Goose to a Rebublic Airline EMB170 – "Snow/Ros's Goose. Saw a flock of medium birds at the last minute and was unable to avoid them. All engine indications were normal. During post flight there were multiple strikes to the A/C in cluding both engines. This was a part replacement. Ramome Cost $28,000."

Offutt AFB

05/17/15 "On takeoff roll bird was spotted on centerline then flew right of aircraft. A thud and change of engine noise were heard. Aircraft was past S1 so continued take off. Engine started to vibrate and shutdown in flight. Dumped fuel and returned to base." $1.8 million in damage/ Turkey Vulture.

02/29/16, "1st stage booster blade damaged on #1 engine. ID's during post flight inspection" $573,829 in damage/ 1 bird struck no ID.

12/07/17 "Bird strike on final approach. Ingested through #3 engine. Damage to 3 pair of fan blades." $15,610/ hawks and owls; 1 bird struck.

05/23/18 "During taxi to runway crew chief observed bird go into #4 engine. He signaled aircraft to stop and let flight crew know. They decided to stop, and MX crew checked out engine. Found bird remains but no ingestion down the core. Engine cleared and sortie continued successfully."

11/02/19 "Strike discovered after flight. #1 engine damage to fan blades." $25,920 in damage/ No Remains No Damage/ Mourning Dove.

To date, no documented wildlife strikes have resulted in loss of human life in Nebraska; 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 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 production in Nebraska contributes substantially to local economies. In 2018, the number of cattle on feed was 2.7 million which ranks first nationally and represents 21% of all cattle fed in the United States. All cattle and calves in 2018 were 6.8 million head the inventory value of all cattle and calves in Nebraska was reported at $12.15 billion dollars in producer gross income in Jan 1, 2018 (Nebraska Agricultural Statistics Service (NASS) 2017).

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 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 Nebraska. 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 Nebraska feedlots. However, blackbird and starling numbers that have been observed by WS-Nebraska personnel at Nebraska feedlots have generally been many times greater than the numbers observed at the Arizona facilities (WS 1996). Therefore, the value of feed losses at Nebraska 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 Nebraska 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 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, chickens, turkeys	In cattle, mastitis, diarrhea, vaginal discharge, and aborted fetuses	causes unsatisfactory growth in 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

Agriculture is an important industry in Nebraska. During 2017, the National Agricultural Statistics Service (NASS) reported over 22.2 million acres were devoted to agricultural production in Nebraska with a market value of agricultural products sold estimated at nearly $22.2 billion (NASS 2017). The top three farm commodities for sales were corn, wheat, and soybean products which together, accounted for nearly 42.4% of the agricultural products sold in the state (NASS 2017). The cattle inventory in the state in 2017 was nearly 6.8 million head (NASS 2017). There were also nearly 7.3 million poultry in the state during 2017 (NASS 2017). The production value of field and other crops grown in Nebraska accounted for nearly $1 billion (NASS 2012). A variety of crops are grown including potatoes, sugar beets, sunflowers, hay, beans, corn, soybeans, wheat, and barley. The market value of aquaculture products was estimated at $21.9 billion in 2017 (NASS 2017). The aquaculture industry in the state raises a variety of freshwater and marine organisms including catfish, trout, baitfish, crustaceans, ornamental fish, and sport/game fish with the value of production valued at nearly $4.1 million.

A variety of bird species can cause damage to agricultural resources in the state. Damage and threats of damage to agricultural resources is often associated with bird species that exhibit flocking behaviors (*e.g.*, Red-winged Blackbirds) or colonial nesting behavior (*e.g.*, pigeons). Damage occurs through direct consumption of agricultural resources, the contamination of resources from fecal droppings, or the threat of disease transmission to livestock from contact with fecal matter. Many of the bird species addressed in this EA have been identified as causing damage to or posing threats to agricultural resources in Nebraska.

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 (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 2013 through November 2017, the FAA (2017) has reports of aircraft striking up to 581 birds in Nebraska. In Nebraska, over 99% of the reported aircraft strikes from January 2013 through November 2017 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 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 Nebraska 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 jamaicesis*), 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 (*Zenaida 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 Nebraska 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-Nebraska has conducted many BDM projects to protect property. An example of one project involved excessive pigeon droppings at several power plants. 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. 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. 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 waterfront 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. Canada Geese have been causing damage at area golf courses for several years. Most golf courses that report damage, or request assistance occur in eastern Nebraska. Canada Geese cause large amounts of damage to the greens, fairways, and tee boxes, where they have become accustomed to foraging on the green grass, leaving large amounts of feces behind. The goose droppings diminish the aesthetic value of the course and continual cleaning operations over time cause damage to the fairways and greens. The geese also nest on and around the golf course, which causes issues with golfers that encounter aggressive geese. Golf course treatments have consisted of lethal and nonlethal methods to alleviate damage. Small to large flocks of up to 400 Canada Geese are common at golf courses and housing developments throughout Nebraska.

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 Nebraska. 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

Damage to aquaculture resources occurs primarily from the economic losses associated with birds consuming fish and other commercially raised aquatic organisms. Damage can also result from the death of fish and other aquatic wildlife from injuries associated with bird predation as well as the threat of disease transmission from one impoundment to another or from one aquaculture facility to other facilities as birds move between sites.

Of those birds shown in Table 1.1 associated with damage to agriculture, of primary concern to aquaculture facilities in Nebraska are Double-crested Cormorants, Ospreys, Great Blue Heron, American White Pelican and to a lesser extent Herring Gulls, Ring-billed Gulls, Belted Kingfishers, American Crows, Common Merganser and Common Grackles.

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-Nebraska could be requested to assist in resolving such problems. In most cases, WS-Nebraska 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-Nebraska 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.

From FY15-19, WS received 156 requests for assistance from State and private hatcheries, and commercial fishing facilities who reported various species of birds were depredating fish at aquaculture facilities. The total value of depredated aquaculture resources for the 5-year analysis period was valued at more than $48,375. Double-crested Cormorants, American White Pelicans and Great Blue Herons were reported as the species that caused most depredation problems in Nebraska (MIS 2015, 2016, 2017, 2018, 2019).

1.3.7 Need for BDM to Protect Natural Resources

Birds can negatively affect natural resources through habitat degradation, competition with other wildlife, and through direct depredation on natural resources. Habitat degradation occurs 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 occurs 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 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 water bird 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, Farraway 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 water birds...*" (Hunter et al 2006).

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 water bird 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 water birds 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 water birds 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 wastewater 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 cause 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 die 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 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). Many 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 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 have been working to quarantine and depopulate an area in southern California that is experiencing a virulent Newcastle disease outbreak. On June 1, 2020 USDA certified that the United States of America (U.S.A.) has satisfied the OIE criteria for eradication of virulent Newcastle disease (vND). The first case was diagnosed on May 17, 2018. The vND response lasted over 2 years, during which time vND was confirmed

on 476 premises in CA, including 4 commercial premises. Single cases were also identified in Utah and Arizona.

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 degree to which cormorant predation affects sport fishery populations in a given body of water is dependent on several 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).

The potential for Great Horned Owl predation on Piping Plover (*Charadrius melodus*) adults and chicks is also a concern to management agencies (Murphy et al. 2003). The population of Piping Plover in Nebraska is both federally and state-listed as threatened and in FY07 to FY11 Nebraska WS helped protect Piping Plover from Great-horned Owl predation. Because of the predatory nature of some bird species, WS could foreseeably be requested to help reduce conflicts for the overall protection and conservation of some bird species. Any human-bird conflict reduction activities with birds protected by the MBTA would be conducted under the necessary permits and the conditions of the permits issued by NGPC and USFWS[4], or conducted under a DO, as appropriate.

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 WS[5]. 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.

Pursuant to the NEPA and the CEQ regulations, WS is preparing this EA[6] 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. For this EA, WS will proceed under the 1978 NEPA regulations and existing APHIS procedures since this EA was initiated prior to the September 14, 2020 NEPA revisions. 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 Nebraska. This EA will also aid WS with clearly

[4] USFWS does not issue permits to take birds where competition or depredation on other species occurs (*e.g.*, raptors preying on gamebirds, piscivorous birds eating naturally occurring or stocked fish {other than aquaculture facilities}, and nest parasitism of non-listed species).

[5] The 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.

[6] The 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).

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 NGPC[7].

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 BDM projects that WS could conduct. 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)[8] in compliance with the NEPA and CEQ regulations.

1.5 DECISION TO BE MADE

Protection of migratory birds is the responsibility of the USFWS. As the authority for the overall custodian 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. NGPC is responsible for managing wildlife in the State of Nebraska, including birds. NGPC 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), NGPC can establish hunting seasons for those species under frameworks determined by the USFWS.

WS-Nebraska BDM activities are coordinated with the USFWS and NGPC, which would gives 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 NGPC; therefore, the take of those bird species for BDM purposes would only occur at the discretion of the USFWS and/or NGPC.

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

- Should BDM as currently implemented by WS-Nebraska be continued in the State?
- If not, how should WS-Nebraska fulfill its legislative responsibilities for managing bird damage in the State?
- What operating policies should be implemented to lessen identified potential impacts?
- Do WS-Nebraska 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 the need for BDM to reduce threats to human safety and to resolve damage to property, natural resources, and agricultural resources on federal, state, tribal, municipal, and private land within the State of Nebraska wherever such management is requested by a cooperator. This EA discusses the issues

[7]Section 1.6 of this EA discusses the roles, responsibilities, and the authorities of each agency.

[8]The 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).

associated with conducting BDM activities in the state to meet the need for action and evaluates different alternatives to meet that need while addressing those issues.

Appendix B discusses the methods that WS is considering for use when conducting the alternative approaches to manage bird damage. The alternatives and Appendix B also discuss how WS would employ methods to manage damage and threats associated with birds. Therefore, the actions evaluated in this EA are the use of those methods available under the alternatives and the employment of those methods by WS to manage or prevent damage and threats associated with birds from occurring when permitted by the USFWS pursuant to the Migratory Bird Treaty Act (MBTA) and/or when permitted by the NGPC.

The MBTA makes it unlawful to pursue, hunt, take, capture, kill, possess, import, export, transport, sell, purchase, barter, or offer for sale, purchase, or barter, any migratory bird, or their parts, nests, or eggs (16 USC 703-711). A list of bird species protected under the MBTA can be found in 50 CFR 10.13.

The MBTA does allow for the take of those bird species listed in 50 CFR 10.13 when depredation occurs through the issuance of depredation permits or the establishment of depredation/control orders. The USFWS is the federal agency responsible for the issuance of depredation permits or the establishment of depredation/control orders for the take of those protected bird species when damage or threats of damage are occurring. Information regarding migratory bird permits can be found in 50 CFR 13 and 50 CFR 21.

1.6.2 Native American Lands and Tribes

The WS program in Nebraska would only conduct BDM activities on Native American lands when requested by a Native American tribe. WS would only conduct activities after WS and the tribe requesting assistance signed a Memorandum of Understanding (MOU), work initiation document, or another similar document. Therefore, the tribe would determine when WS' assistance was required and what activities the tribe would allow. Because tribal officials would be responsible for requesting assistance from WS and determining what methods would be available to alleviate damage, no conflict with traditional cultural properties or beliefs would be anticipated. Those methods available to alleviate damage associated with birds on federal, state, county, municipal, and private properties under the alternatives analyzed in this EA would be available for use to alleviate damage on tribal properties when the use of those methods had been approved for use by the tribe requesting WS' assistance. Therefore, the activities and methods addressed under the alternatives would include those activities that could be employed on Native American lands, when requested and when agreed upon by the tribe and WS.

1.6.3 Federal Lands

WS could continue to provide assistance on federal, state, county, municipal, and private land in Nebraska under two of the alternatives analyzed in detail when the appropriate resource owner or manager requested such assistance from WS. The methods employed and potential impacts are the same on these lands as they would be on private lands upon which WS-Nebraska provides service. Therefore, if WS-Nebraska 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-Nebraska 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-Nebraska determines that new needs for action, changed conditions, new issues, or new alternatives having different environmental impacts must be analyzed. At that time, this analysis and document will be reviewed and revised as necessary. Review of the EA would be conducted to ensure that activities implemented under the selected alternative occur within the parameters evaluated in the EA. If the alternative analyzing no involvement in damage management activities by WS-Nebraska were selected, no additional analyses by WS-Nebraska would occur based on the lack of involvement by WS-Nebraska. The monitoring of activities by WS-Nebraska would ensure the EA remained appropriate to the scope of activities conducted by WS-Nebraska in Nebraska.

1.6.5 Site Specificity

This EA analyzes potential impacts of BDM on the human environment as required by NEPA and addresses WS-Nebraska BDM activities on all lands under Cooperative Agreement or WIDs or as otherwise covered by WS-Nebraska Work Plans (e.g., on federal public lands) within Nebraska. It also addresses the impacts of BDM on areas where additional agreements with WS-Nebraska may be written in the reasonably foreseeable future in Nebraska. 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 like 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-Nebraska 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 regarding 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, except for 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., NGPC game management units). WS-Nebraska monitors target bird and nontarget take for Nebraska and in each county. The game management units and counties do not correspond to each other in Nebraska; 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 Nebraska is

estimated by NGPC 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 ± 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 Nebraska

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 Nebraska.

The primary statutory authorities for the APHIS-WS program are the Acts of March 2, 1931, as amended, and December 22, 1987, 7 U.S.C. §§ 8351-8353. 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 service's 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-Nebraska conducts WDM in cooperation with and under the authorities of NDA and NGPC. WS-Nebraska 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 Nebraska are discussed in Section 3.3, and each bird damage situations may require the use of one or more of these.

1.7.1.2 Nebraska Game and Parks Commission (NGPC). The NGPC is responsible for managing all protected and classified wildlife in Nebraska, including federally listed T&E species, despite the land class the animals inhabit (RSN 37-101, 37-204, 37-209, 37-211, 37-215, 37-301, 37-432, 37-432.01, 37-434). The NGPC is also authorized to cooperate with WS-Nebraska and NDA for controlling predatory animals.
The NGPC has responsibility for protecting endangered and threatened species under authority of the Nongame and Endangered Species Conservation Act (NESCA) (Neb. Rev. Stat. § 37-801 to 37-811). Since 2013, staff of the WS-Nebraska program, U.S. Fish and Wildlife Service, and NGPC have corresponded through emails, phone conversations and in-person meetings to develop a Biological Assessment (BA) evaluating potential impacts of Nebraska-WS activities on endangered and threatened species in Nebraska. The

BA also describes WDM methods and standard operating procedures (i.e., conservation conditions) used to avoid and minimize such impacts. Staff of theNGPC have reviewed this information and provided a concurrence letter in December 2017 with the effect determinations listed in the BA for the species as follows:

May Affect, Not Likely to Adversely Affect: gray wolf, northern long-eared bat, river otter, southern flying squirrel, swift fox, Interior Least Tern, Mountain Plover, Piping Plover, *Rufa* Red Knot, Whooping Crane, Blacknose shiner, Finescale dace, Northern redbelly dace, Sturgeon chub, Topeka shiner, and western massasauga

No Effect: black-footed ferret, Eskimo Curlew, Lake sturgeon, Pallid sturgeon, American burying beetle, Salt Creek tiger beetle, scaleshell mussel, American ginseng, blowout penstemon, Colorado butterfly plant, saltwort, small white lady's slipper, Ute ladies'-tresses, and western prairie fringed orchid

This concurrence is based on a review of the material that WS-Nebraska, information exchanged via phone, email or in person, and the WS-Nebraska program's agreement and commitment to implementing the standard operating procedures (i.e., conservation conditions) as indicated in the 2017 BA. If WS-Nebraska's program activities change or if new species become listed, then we recommend further coordination with the Nebraska Game and Parks Commission Planning and USFWS.

1.7.1.3 Nebraska Department of Agriculture (NDA). The NDA has an MOU with WS that establishes a cooperative relationship between WS and NDA outlines responsibilities and set forth objectives and goals for each agency for resolving wildlife Damage management conflicts in Nebraska.

The NDA is responsible for regulating pesticide use in the State. Pesticides that would be available to manage predators would be registered and approved for use through the NDA. Personnel of WS-Nebraska that use any pesticide restricted-use pesticides must become a certified pesticide applicator by the NDA or be supervised by a certified applicator.

"The Director of Agriculture may contract and cooperate with the Animal and Plant Health Inspection Service of the United States Department of Agriculture in the management and control of (1) coyotes, bobcats, foxes, and other predatory animals listed in section 23-358 in this state that are injurious to livestock, poultry, and game animals and the public health, (2) black-tailed prairie dogs and other injurious commensal and field rodents, and (3) nuisance birds or other nuisance wildlife in accordance with organized and systematic plans of the Animal and Plant Health Inspection Service of the United States Department of Agriculture for the management and control of such animals. Supervision of the program shall be by the local representative of the Animal and Plant Health Inspection Service of the United States Department of Agriculture. Expenditure of funds appropriated by the Legislature may not be made without the approval in writing by the director. The director in cooperation with the Animal and Plant Health Inspection Service of the United States Department of Agriculture may enter into agreements with other governmental agencies and with counties, associations, corporations, or individuals when such cooperation is deemed to be necessary to promote the management and control of such predatory animals, black-tailed prairie dogs and other injurious commensal and field rodents, nuisance birds, or other nuisance wildlife. "(RSN 81-2,236)

"There is hereby created the Animal Damage Control Cash Fund. Such fund shall be administered by the Department of Agriculture. The fund shall consist of funds received from any source to carry out the animal damage control program pursuant to section 81-2,236. Any money in the fund available for investment shall be invested by the state investment officer pursuant to the Nebraska Capital Expansion Act and the Nebraska State Funds Investment Act" (RSN 81-2,237).

1.7.1.4 University Lincoln Nebraska Cooperative Extension Service (UNL-CES). The UNCE through its Educators, Specialists and Assistants provides a wide range of information on the prevention and control of wildlife damage. The UNCE conducts educational programs pursuant to the Smith–Lever Act of 1914 (7 USC 341-349) and subsequent amendments.

WS-Nebraska would work cooperatively with local livestock associations and county governments to provide assistance for their constituents. WS-Nebraska would provide assistance with managing damage or threats associated with birds statewide in areas where funding was available. Activities could occur on both private and public lands.

1.7.1.5 U.S. Fish and Wildlife Service. USFWS is is the federal agency that administers the EndagageredSpecies Act, Migratory Bird Treaty Act, and Bald and Golden Eagle Protection Act.. 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-Nebraska WDM activities. WS-Nebraska 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 Nebraska. 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)). In 2017, WS initiated informal consultation with the USFWS on WDM in Nebraska. This included BDM. WS completed a Biological Assessment (BA) assessing potential impacts to federally listed species. Several discussions and a few drafts were exchanged before WS submitted a final draft of their BA to the USFWS, and that occured December 22, 2017. Based on WS' analysis of their program, and commitment to implement conservation measures that would avoid impacts to federally listed species, the USFWS provided concurrence January 12, 2018.

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-Nebraska 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-Nebraska 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 Nebraska 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-Nebraska are registered with and regulated by the EPA and NDA and are used by WS-Nebraska 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-Nebraska 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.

Tribe's request WS-Nebraska BDM and sign agreements for WS-Nebraska to conduct BDM on their lands; thus, tribes have control over any potential conflict with cultural resources on tribal properties. WS-Nebraska 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 Nebraska 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 Nebraska, 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-Nebraska's involvement in BDM in Nebraska is that if, for whatever reason, the BDM conducted by WS-Nebraska 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 Nebraska, except that, based on WS-Nebraska employees' years of professional expertise and experience in dealing with BDM actions,

WS-Nebraska 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-Nebraska 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-Nebraska 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-Nebraska BDM assistance. Thus, WS-Nebraska has a limited ability to affect the environmental status quo in Nebraska. 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).

- **Issue 1:** Effects of BDM on Target Bird Species Populations
- **Issue 2:** Effects of BDM on Nontarget Species Populations, including T&E Species
- **Issue 3:** Effects of BDM on Public and Pet Safety and the Environment
- **Issue 4:** Effects of BDM on Aesthetics

2.1.1 Issue 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-Nebraska'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 quiscala*)). Other species that have been killed in limited numbers include Great Blue Herons (*Ardea herodias*), Cattle Egrets (*Bubulcus ibis*), Great Egrets (*Casmerodius albus*), 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-Nebraska 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 Great Blue Herons. 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 Nebraska covered by this EA, especially information pertaining to their range and seasonal movements in Nebraska.

The species are basically given in order of WS-Nebraska BDM efforts directed towards them, their subsequent take, and the occurrence and value of damage that the species cause in Nebraska Some of the lesser damaging species are lumped with others where life history and damage are somewhat similar. Finally, the USFWS and NGPC administer laws that protect migratory birds. However, it is the responsibility of the lead federal agency or agency carrying out the BDM activity to ensure compliance with the MBTA. There are many agencies and organizations that manage migratory bird populations under the authorization of permits from USFWS and NGPC 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 Nebraska by hunters. Where data is available, harvest is used with WS-Nebraska 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 Nebraska. Seven species of blackbirds are found in Nebraska; Red-winged, Yellow-headed (*Xanthocephalus xanthocephalus*), Common and Great-tailed Grackles, and Brown-headed Cowbirds and all are abundant seasonally. However, the Rusty blackbird which does accure in Nebraska are not abundants and there are concerns regarding their decline. 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. 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 are 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. 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. Most blackbirds leave Nebraska during winter, but the European Starling can be found in Nebraska year-round. The Yellow-headed Blackbird only breeds in Nebraska, typically migrating south for the winter. The European Starling, Red-winged Blackbird, Common Grackle, and Brown-headed Cowbird are the most abundant species in Nebraska, 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 can build up, they can become a source of several infectious diseases. Nesting by starlings can create several problems, including nuisance and fire hazards to buildings. 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 songbirds such as the warbles, a historic nester in Nebraska.

Pigeons and Doves. Feral pigeons (Rock Pigeons), Mourning Doves (*Zenaida macroura*), and Eurasian Collared-Doves (*Streptopelia decaocto*) are found in Nebraska. 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 Nebraska. 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, accipiter's, buteos, and falcons), and owls. Nebraska has one species of vulture, 1 eagle, 3 hawks, 4 owls, and 1 shrike 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 (accipiter's) ambush, hovering (kestrel), and watching from perches (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. However, this problem infrequently occurs in Nebraska. 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. WS-Nebraska personnel avoid harassing eagles but would if it became necessary at an airport where they were a potential threat to aircraft. WS personnel obtain a Migratory Bird Permit that allows them to harass and deture Bald Eagles from the airfields. The permit allows the permittee authorization to use non-lethal scaredevices, scare tactics, or frightening devices to move or disperse Bald Eagles endangering human safety. The Bald Eagle (*Haliaeetus leucocephalus*), Northern Harrier (*Circus cyaneus*), Peregrine Falcon (*Falco peregrinus*), Burrowing Owl, and Loggerhead Shrike (*Lanius ludovicianus*) are species of special concern (USFWS 2018) and considered accordingly.

Waterfowl and Cranes. 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 Nebraska. Most are common seasonally, some only migrating through Nebraska. Of all 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 concern 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 Nebraska. The largest, the Great Blue Heron, is very common. However, the Cattle Egret and Black-crowned Night-Heron (*Nycticorax nycticorax*) are not as common as the Great Blue Heron. The others wading birds are present, but not common as the other species. 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 Nebraska (USFWS 2008).

Shorebirds. Nebraska hosts 37 species of shorebirds including avocets, stilts, plovers, sandpipers and phalaropes. Most only migrate through Nebraska, 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 like 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 or when airports are located near wetland areas. 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 Nebraska. 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 Nebraska, but most only migrate through the State with breeding in isolated areas. The majority winter further south. Terns are typically like 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 setback 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 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 (*Sternula 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 Nebraska, but only the Blue Jay (*Cyanocitta cristata*), and American Crow are somewhat abundant. However, Black-billed Magpie (*Pica hudsonia*) in the north-central United States have declined following the invasion of West Nile Virus (Benner and Jorgensen 2020) .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 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 but a fee-exempt permit from NGPc is required.

Woodpeckers. Eight species of woodpeckers are found in Nebraska and all are 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 territorial, damage is typically at low levels and uniform throughout orchards rather than focused in an 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 Nebraska. Two nightjars, the Eastern Whip-poor-will (*Caprimulgus vociferous*) and Chuck-will's-widow (*Caprimulgus carolinensis*) are also found in Nebraska 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 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 Nebraska in any numbers, the Ring-billed (*Larus delawarensis*), Herring (*Larus argentatus*), Bonaparte's (*Larus philadelphia*), and Franklin's Gulls (*Larus pipixcan*). Many gulls in Nebraska 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 Nebraska. 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*), Wild Turkey (*Meleagris gallopavo*), and Northern Bobwhite (*Colinus virginianus*) are found in Nebraska 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 NGPC (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. Nebraska commonly has a species of loon (*Gavia immer*) and 5 grebes that mostly migrate through Nebraska with few breeding or wintering. None of them is particularly common. Loons are large water birds 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 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 Nebraska and can cause damage. The most notable of these in Nebraska, 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 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, like 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 Nebraska. 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, except for 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, 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 these species are migratory nongame birds.

Other Birds. A few other birds in Nebraska 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 common in the southern counties of Nebraska. 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 Nebraska (Table 2 in Appendix B), but few causes, or are expected to cause, damage.

2.1.1.2 Bird Population Estimates. To determine impacts from WS-Nebraska 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 bird's species have populations that are truly both (e.g., Canada Geese). Many WS-Nebraska BDM projects involving migratory birds come from the Central Flyway, but some can come from the other flyways in North America (Figure 3). Several migratory

species are found in Nebraska year-round, but the population may shift during the year (e.g., European Starling). Additional birds may come into Nebraska for the winter while some that summer in Nebraska may leave. Some species only nest in Nebraska 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 Nebraska (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-Nebraska 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 must 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 geographic area and is best calculated over several 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 Nebraska, 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.

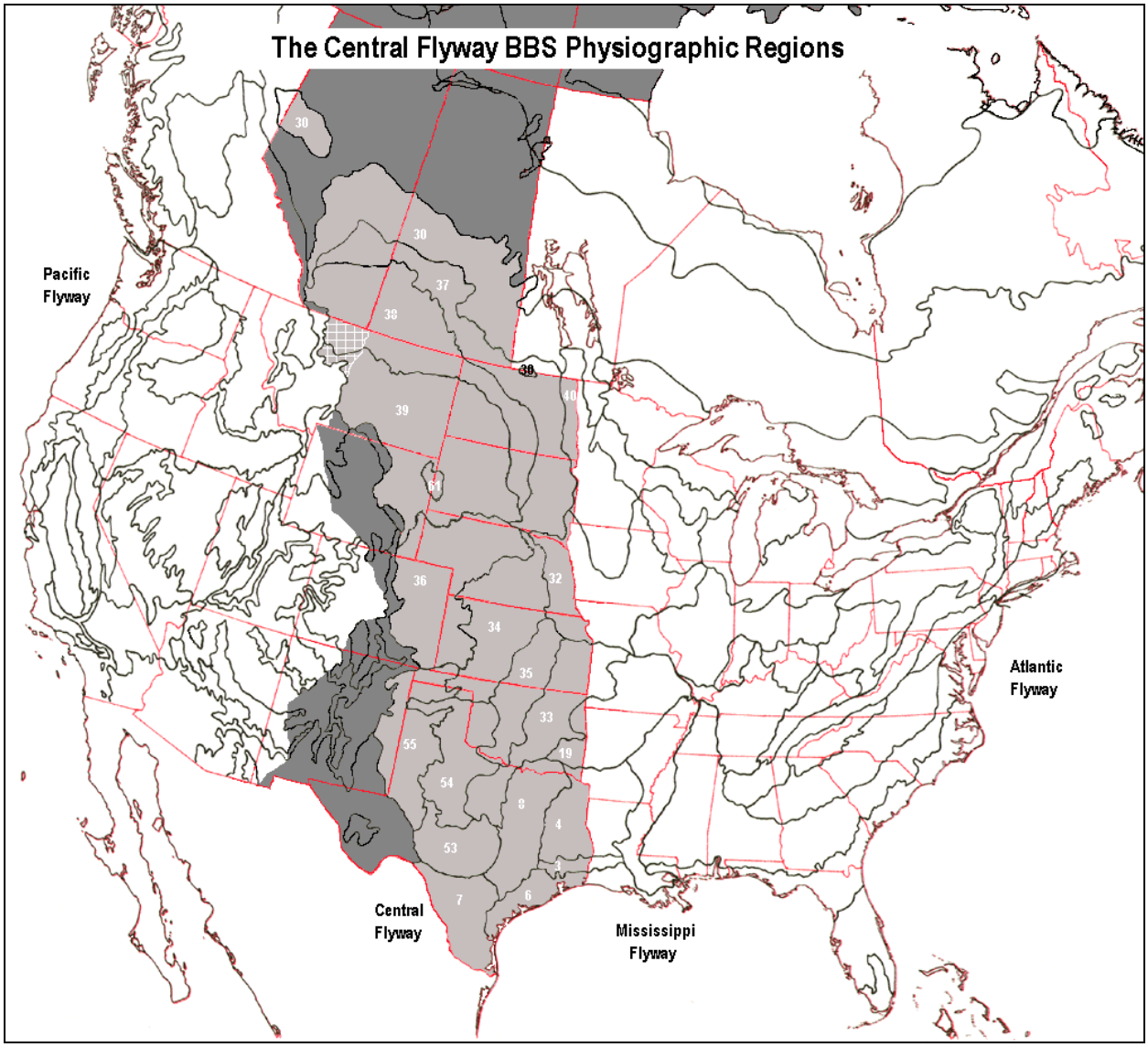

Figure 3. BBS physiographic regions with the Central Flyway (shaded) BBS physiographic regions (shaded light gray) used to estimate migratory bird populations for this EA, including those portions of 38 and 39 in Montana (thatched white) in the Pacific Flyway, but excluding deserts, mountainous, and 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 timeframe (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 most of the 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 many BDM projects in Nebraska 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 mi^2). 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/mi^2/detection percentage.

WS-Nebraska will use BBS data from 2005 to 2015 to estimate populations that are impacted lethally by WS-Nebraska BDM. WS-Nebraska conducts BDM for most all species that are either residents in Nebraska 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, Nebraska, 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-Nebraska lethally controls in Nebraska 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-Nebraska 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 another 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-Nebraska receives occur during winter when migratory birds have move into Nebraska, thus changing bird population numbers. 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 Nebraska 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 mi^2). 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 Issue 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-Nebraska's operating policies include measures intended to reduce the effects of BDM activities on nontarget species populations and are presented in Chapter 3. From (FY2015-FY2019), WS-Nebraska 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 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. Several other bird species, including some T&E species, could benefit from reductions in populations of Brown-headed Cowbirds which parasitize nests of migratory 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 2018 on the potential for WDM, in general and including most BDM methods currently used, to impact the species listed nationwide, including those in Nebraska. USFWS, consulted under Section 7 of the ESA, issued BOs on the species that WS had the likelihood to adversely affect. WS in an informal consultation with USFWS concluded with a concurrence from the USFWS, dated January 12, 2018 that the based on the effect determinations (refered to as SOPs in appendix of BA) made in the December 2017 BA would reduce the potential for take (USDA 2018). 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 Nebraska (Table 1) includes 3 mammals,6 birds, 2 fish, 3 invertebrates, and 3 plants. WS-Nebraska BDM will have no effect on listed mammals, fish, invertebrates, and plants. WS made a may affect, not likely to adversely affect determination for the whooping crane, Interior least tern, and piping plover in their BA and according to the 2018 BO offered by the USFWS.

Table 1. T&E and candidate species federally listed in Nebraska.

Species	Scientific Name	Status	Locale	BDM
Mammal				
Gray Wolf	*Canis lupus*	E		0
Northern-Long Eared Bat	*Myotis septentrionalis*	T 4(d) rule	SouthEast	0
Black-footed Ferret	*Mustela nigripes*	E		0
Bird				
Whooping Crane	*Grus americana*	E	Statewide	-,0, +
Red Knot	*Calidris canutus rufa*	T	Statewide	0
Piping Plover	*Charadrius melodus*	T	Statewide	+
Least Tern (interior pop.)	*Sterna antillarum*	E	Statewide	+
Eskimo Curlew	*Numenius borealis*	E		0
Eastern Black Rail	*Laterallus jamaicensis*	T 4(d) rules		0
Fish				
Pallid Sturgeon	*Scaphirhynchus albus*	E	Northeast	0
Topeka Shiner	*Notropis topeka*	E	Statewide	0
Invertebrate				
American Burying Beetle	*Nicrophorus americanus*	T 4(d) rule	Northeast	0
Salt Creeek Tiger Beetle	*Cicindela nevadica lincolniana*	E	East	0
Scaleshell Mussel	*Leptodea leptodon*	E	Southeast	0
Plants				
Blowout Penstemen	*Penstemon haydenii*	E	West	0
Western Prairie Fringed Orchid	*Platanthera praeclara*	T	Northeast	0
Ute Ladies'-tresses	*Spirantes divuvialis*	T	West	0

Summary ratings for impacts are: "-" = Low Negative; "0" = None; "+" = Low Positive

Whooping Crane. This species breeds in northern Canada and migrates through Nebraska on their way to their wintering grounds in Texas. In Nebraska, 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 as discussed in USFWS (USFWS 2018) would be the use of avicides on grain baits 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. NGPC (May 2020a) lists animals that are considered T&E in Nebraska. This list contains most all federally listed species. It also lists a few additional species. WS-Nebraska will have no effect on Nebraska listed mammals (3), reptiles, (5), fish (1), and invertebrates (0). NGPC lists 6 species of birds as T&E, and all but 1 is also federally listed and discussed above. The 1 additional species being the Mountain Plover. WS-Nebraska did conduct predator damage management activities for nesting Least tern and Pipping plover in Nebraska from FY15 to FY19 on the Platte river. WS-Nebraska would discuss needed hazing efforts with NGPC and obtain appropriate permits as necessary, if these species were found in an air operating area of an airport where WS-Nebraska 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 Mountain 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 Nebraska, 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 Nebraska on lakes and rivers throughout the State. BDM has very minimal potential to negatively impact Bald Eagles and none have been taken by WS-Nebraska. 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 Issue 3 Effects of BDM on Public and Pet Safety and the Environment

WS-Nebraska uses a variety of methods when conducting BDM. WS-Nebraska personnel have operating policies to reduce potential safety impacts from BDM to the public and the environment. WS-Nebraska 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-Nebraska 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-Nebraska 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-Nebraska 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 Nebraska Pesticide Law, and by WS Directives. WS-Nebraska 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 euthanizing drugs such Beuthanasia D®. These drugs are regulated by FDA under the Food, Drug, and Cosmetic Act and WS policy. The chemicals used by WS-Nebraska from FY15 to FY19 are shown in Table 2 with the species they were used to control. WS-Nebraska used an average of about 0.4 pounds of DRC-1339, and 0 ounces of Avitrol®. This is a minimal use of chemicals.

Table 2. Chemicals used by WS-Nebraska in BDM from FY15 to FY19. Avian toxicants (DRC-1339 and Avitrol®) are registered for use by EPA and euthanasia (Beuthanasia D®) drugs through FDA.

Species	Chemical	FY15	FY16	FY17	FY18	FY19	Ave.
European Starling	DRC-1339 (g)	954.5	1,398	1,769.9	1,404	902	1,285.7
Feral Pigeon		161	17	46	184	609	203.4
TOTAL DRC-1339 USED		1,115.5	1,415	1,815.9	1,588	1,511	1,489.1
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-Nebraska 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 Nebraska 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 2019a) including BDM methods used by WS-Nebraska such as toxicants, repellents, immobilization drugs, firearms, pyrotechnics, and traps. Under the proposed action, WS-Nebraska could use DRC-1339, Avitrol®, and euthanasia drugs such as Beuthanasia D®. From FY15 to FY19 WS-Nebraska used an annual average of 1289 grams 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-Nebraska BDM activities is the potential for adverse effects from not having professional assistance from programs like WS-Nebraska available to private entities that express needs for such services. WS-Nebraska 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 dicrotophos (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-Nebraska 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 Issue 4 Effects of BDM on Aesthetics

Some individual members or groups of wild and feral domestic bird species habituate and learn to live near 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-Nebraska nonlethal harassment activities. The public's ability to view wild birds in an area would be more limited if the wildlife is removed or relocated. However, immigration of wildlife from other areas could possibly replace the animals removed or relocated during a BDM activity. 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 Nebraska 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-Nebraska can predict the types of locations or situations where damage is likely to occur. However, due to any number of variable circumstances, WS-Nebraska has no absolute control over when a request for BDM assistance will be received nor can WS-Nebraska predict specific, individual times and locations of most bird damage situations. Therefore, WS-Nebraska must be ready and able to provide assistance on short notice about anywhere in Nebraska. 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-Nebraska 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-Nebraska 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-Nebraska 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 and Golden Eagles. In general, sport hunting using rifles or shotguns, which would be similar in nature to ground-based shooting by WS-Nebraska regarding 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 Nebraska 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 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 effects 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 noisemaking 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-Nebraska 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-Nebraska employee locates a burial site, the employee would notify the appropriate Tribe or official. WS-Nebraska 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-Nebraska. However, in consideration of Nebraska' Native Americans, WS-Nebraska has included all of the recognized Tribes in Nebraska 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-Nebraska 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. Nebraska' 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*)), despite liberal hunting seasons and the killing of hundreds or thousands of these animals annually. The legislated mission of USFWS and NGPC is to preserve, protect, and perpetuate all the wildlife in the United States and Nebraska. Therefore, USFWS and NGPC 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-Nebraska 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 2008), "*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-Nebraska 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 2008) was the potential for BDM chemicals to affect water quality to the point that adverse effects 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-Nebraska BDM program, WS-Nebraska would use DRC-1339 in accordance with EPA-approved label directions. The risk to aquatic organisms from the use of DRC-1339 is minimal. The method of application, label requirements for removal of unused bait and carcasses, and "No treatment" buffers adjacent to aquatic habitats results in a low potential for exposure and risk. A comparison of the available effects data for aquatic vertebrates and invertebrates to the estimated acute aquatic residues in static water bodies show wide margins of safety for aquatic organisms. Chronic effects data for aquatic invertebrates and vertebrates is not available, but the method of application for DRC-1339, collecting unused bait, and no treatment application buffers from aquatic water bodies, in addition to a short half-life in the environment would suggest that chronic risk would be negligible.

DRC-1339 is moderately toxic to fish. The 96-hour median lethality concentration (LC50) for bluegill is 11 ppm. The 96-hour LC50 for the rainbow trout is 9.7 ppm. The 96-hour LC50 for southern leopard frog (*Rana sphenocephala*) tadpoles is 44 mg/L (Marking and Chandler 1981).

DRC-1339 has moderate to high toxicity to aquatic invertebrates depending on the test species (Table 3). The 48-hour median effective concentration (EC50) for the freshwater cladoceran is 0.07 ppm (USEPA 2011a) while marine species appear to be more tolerant with 96-hour LC50 values of 10.8 and 16.0 ppm for the penaeid shrimp and blue crab, respectively (Walker et al. 1979) (Table 4).

[1]7 Court cases not given in Literature Cited section.

Table 3 Acute aquatic invertebrate toxicity for DRC-1339 technical.

Test species	Test	Results	Reference
Cladoceran (*Daphnia magna*)	EC_{50}	0.07 mg/L	USEPA 2011a
	LC_{50}	1.6 mg/L	Marking and Chandler 1981
Caddisfly (*Isonychia* sp.)	LC_{50}	6.5 mg/L	Marking and Chandler 1981
Mayfly (*Hydropscyche* sp.)	LC_{50}	12 mg/L	Marking and Chandler 1981
White River Crayfish (*Procambarus acutus acutus*)	LC_{50}	15 mg/L	Marking and Chandler 1981
River Horn Snail (*Oxytrema catenaria*)	LC_{50}	6.7 mg/L	Marking and Chandler 1981
Glass Shrimp (*Palaemetus kadiakensis*)	LC_{50}	6.1 mg/L	Marking and Chandler 1981
Panaeid Shrimp (*Panaeus* sp.)	LC_{50}	10.8 mg/L	Walker et al. 1979
Blue Crab (*Callinectes sapidus*)	LC_{50}	16.0 mg/L	Walker et al. 1979
Asiatic Clam (*Corbicula manilensis*)	LC_{50}	18.0 mg/L	Marking and Chandler 1981

The other primary chemical used by WS-Nebraska, 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-Nebraska 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-Nebraska use of DRC 1339 (1,489.08 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 found 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). If 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-Nebraska 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 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-Nebraska 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 Nebraska (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 cattails 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-Nebraska Only.** Under this alternative, WS would use only nonlethal methods in BDM. WS-Nebraska could still recommend the use of lethal methods but would not partake in implementing them.

3) **Alternative 3 – WS-Nebraska Provides Technical Assistance Only for BDM.** Under this alternative, WS-Nebraska would not conduct any direct operational BDM activities in Nebraska. If requested, WS-Nebraska would provide affected resource owners with technical assistance information only.

4) **Alternative 4 - No Federal WS-Nebraska BDM.** This alternative consists of no federal BDM program by WS-Nebraska or other federal agency.

3.2 DESCRIPTION OF THE ALTERNATIVES

3.2.1 Alternative 1 – Continue the Current Federal BDM Program (No Acton/Proposed Action)

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-Nebraska 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 disease 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-Nebraska 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-Nebraska 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-Nebraska 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-Nebraska 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-Nebraska only function would be to implement lethal methods, if any were determined to be necessary to resolve a damage problem.

BDM by WS-Nebraska 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-Nebraska Only

This alternative would require WS-Nebraska 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 is currently only available for use by WS-Nebraska employees and could not be used by private individuals. Section 3.3.1.3 describes nonlethal methods available for use by WS-Nebraska under this alternative and the lethal techniques that could be used by State agency personnel and private individuals.

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

This alternative would not allow for WS-Nebraska operational BDM in Nebraska. WS-Nebraska 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 is only available for use by WS-Nebraska 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-Nebraska BDM

This alternative would eliminate federal involvement in BDM in Nebraska. WS-Nebraska would not provide direct operational or technical assistance and requestors of WS-Nebraska services would have to conduct their own BDM without WS-Nebraska 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-Nebraska 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-Nebraska technical assistance and operational BDM by WS-Nebraska.

3.3.1 Alternative 1 – Continue the Current Federal BDM Program

WS-Nebraska currently uses many of the BDM methods available for use. Some BDM methods are widely used, while others are used infrequently. WS-Nebraska 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-Nebraska under the current BDM program.

3.3.1.1 The IWDM Strategies That WS-Nebraska 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-Nebraska provides supplies or materials that are of limited availability for non-WS-Nebraska 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-Nebraska 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-Nebraska 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-Nebraska personnel are often required to effectively resolve problems, especially if restricted use pesticides are necessary, or if the problem is complex. WS-Nebraska direct BDM assistance involves the implementation of lethal control or nonlethal capture or harassment methods.

3.3.1.2 WS-Nebraska Decision Making.

WS-Nebraska 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-Nebraska 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-Nebraska conducts BDM illustrating the WS Decision Making process.

European Starling Problems

During the fall and winter months in Nebraska, 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-Nebraska responds directly to requests each year where large numbers of starlings are causing damage. WS-Nebraska generally uses technical assistance initially, recommending noise harassment strategies such as propane cannons, pyrotechnics, and harassment shooting. Where these methods become ineffective, WS-Nebraska may use the avicide DRC-1339. Shooting, as well as capturing and euthanizing starlings, are also examples of lethal methods that WS-Nebraska simultaneously integrates along with nonlethal strategies.

Feral Domestic Pigeon Problems

Feral domestic pigeons are responsible for many nuisance bird damage requests for assistance in Nebraska. 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 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-Nebraska has been requested in recent years to reduce local pigeon numbers in several cities and facilities around the state. WS-Nebraska expects to receive future requests from across Nebraska 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-Nebraska 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-Nebraska 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-Nebraska, but WS-Nebraska 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-Nebraska 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-Nebraska 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 4) 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 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 habitats. Most habitat management recommended by WS-Nebraska 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.

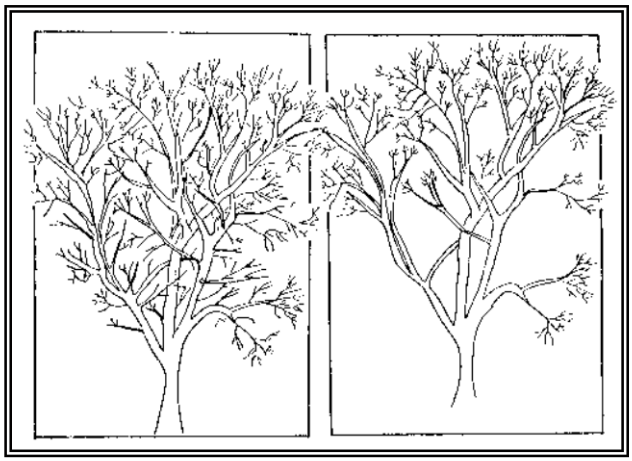

Figure 4. Tree pruning to reduce attractiveness to birds.

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 influence 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-Nebraska 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-Nebraska will ensure that the cooperator is aware for the need to address T&E species impacts. Habitat management recommendations by WS-Nebraska 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-Nebraska, 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-Nebraska often tries to alter human behavior to resolve potential conflicts between humans and wildlife. For example, WS-Nebraska 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 cause potential injures, 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 affected 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 must 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, fishponds, 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, fishponds 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 5). 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. 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.

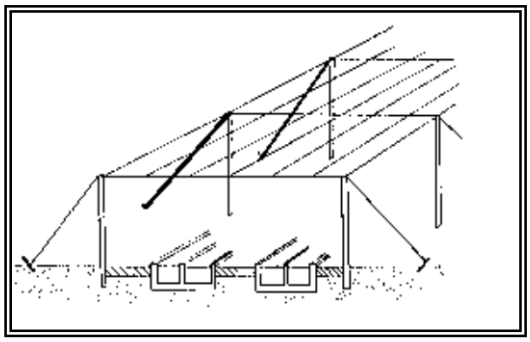

Figure 5. Overhead wire grid to exclude birds.

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 6) 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 7) 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, windowsills 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.

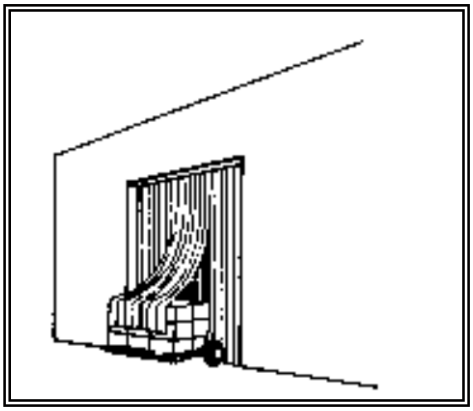

Figure 6. Entrance barricade to deter birds.

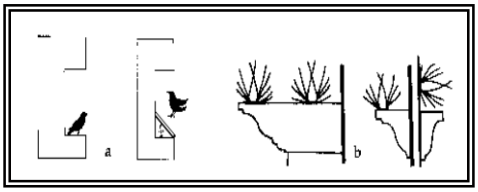

Figure 7. Porcupine wire on ledge to deter birds.

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, several 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 windsocks), 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 8) 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.

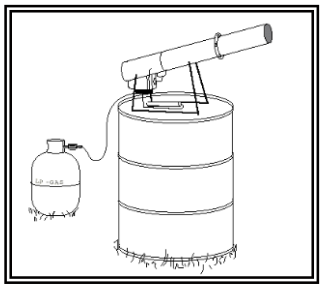

Figure 8. Propane exploder.

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, like 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, fishpond 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 Simulated 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 trails (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 LD_{50} (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-Nebraska would consult with the USFWS or NGPC to coordinate capture, transportation, and selection of suitable relocation sites.

Chemical Repellents. Chemical repellents are nonlethal chemical formulations used to discourage or disrupt 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-Nebraska.

Chemical repellents, as used by WS-Nebraska, 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., Mesurol®), or polybutene's (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 influence nontarget species.

Methyl anthranilate (artificial grape flavoring used in foods and soft drinks for human consumption) could be used or recommended by WS-Nebraska 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/bee[1]), nontoxic to rats in an inhalation study (LC_{50} > 2.8 mg/L[2]), 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 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

[1]An 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.

[2]An 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.

methods. However, the fogging method is currently not registered for use in New Mexico and therefore cannot legally by 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 need 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.

Foothold traps are versatile and widely used by WS-Nebraska for capturing many species. These traps can be utilized to live-capture a variety of animals but are most often used by WS-Nebraska 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 leg-hold 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 leg-hold 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-Nebraska 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 2018) 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 varies 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 varies 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-Nebraska 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 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, like 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 m^2 to 25 m^2 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 9) 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.

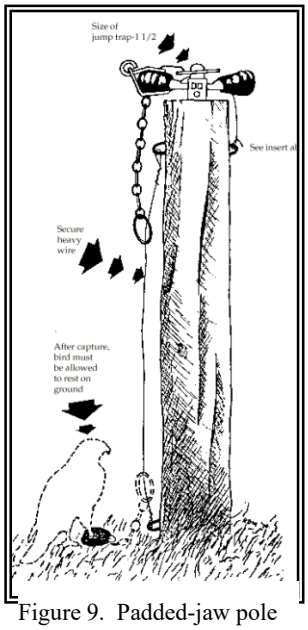

Figure 9. Padded-jaw pole trap.

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-Nebraska personnel do use lead-based ammunition in rifles and sometimes shotguns. WS-Nebraska 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-Nebraska often uses steel or other non-toxic shot as necessary to minimize the risk of lead poisoning to scavengers. The USFWS did identify this as a concern in their BA (USDA 2017) which covered potential adverse effects on Bald Eagles and Golden Eagle from all WS used WDM methods, including shooting. A concurrence from the USFWS was conculted in the 2017 cansalulation. The use of lead in ammunition is covered in the Lead Risk Assessment specifically (USDA 2019c).

Sport hunting is sometimes recommended by WS-Nebraska 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 NGPC 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 are 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 are practiced by manual removal of the eggs or nest.

Some species frequently attack people to guard their nests. In Nebraska, species that will 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-Nebraska 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 renest 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-Nebraska 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-Nebraska 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-Nebraska 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 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-Nebraska in BDM.

DRC-1339 (EPA. Reg. No. 56228-63), 3-chloro-4-methylbenenamine hydrochloride, is an avian pesticide registered with EPA. DRC-1339 is an avicide (toxicant for birds) used by the U.S. Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), Wildlife Services (WS) Program to reduce bird conflicts at livestock facilities and airports, and to reduce damage to crops, livestock, property, and natural resources, including threatened and endangered species, per label allowances. The primary target species include European starlings, rock pigeons, Eurasian collared-doves, and specific species of blackbirds, corvids, and gulls. DRC-1339 is a very pale yellow, crystalline powder that is highly soluble in water and other polar solvents. It was named from a code it received at the Denver Research Center (DRC), as the 1,339th chemical tested at the Center, which became its common name. It has also been known by the tradename Starlicide®, which was originally registered as a pelleted bait for starlings under a label from Purina Mills in 1967.

For more than 50 years, DRC-1339 has proven to be an effective tool for starling, pigeon, blackbird, corvid, and gull 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 kills target birds between 3 and 80 hours after ingestion of a lethal dose (Dawes 2006). The slow action of the avicide allows the chemical to be partially or mostly metabolized prior

to the birds succumbing to the chemical (Schafer 1984, Goldade 2017). DRC-1339 appears to pose little risk of secondary poisoning to nontarget animals, including avian scavengers (Cunningham et al. 1979, Schafer 1984, Knittle et al. 1990). The technical grade of the active ingredient is very highly acutely toxic to many pest birds, but generally less acutely toxic to raptors, waterfowl, finches, and other birds, and most mammals (DeCino et al. 1966, Palmore 1978, Schafer 1981). For example, an 89g starling, a highly sensitive species, requires a dose of only 0.3 mg/bird to cause death (Royall et al. 1967) while many other bird species such as raptors, house sparrows, and finches are classified as non-sensitive, requiring a much higher dose (Eisemann et al. 2003). A 29 g house sparrow would require a dose of 9 mg, while a 22 g housefinch and a 118 g American kestrel would require more than 5 mg and 38 mg (DeCino et al. 1966, Schafer et al. 1983). It should be noted that larger birds and pigeons require more product (more toxicant) to be taken lethally. Secondary hazards of DRC-1339 are likely very low unless toxic bait is still largely intact in the carcass. DRC-1339 acts in a relatively humane manner producing a quiet death (Timm 1994, Dawes 2006). Prior to the application of DRC-1339, prebaiting is often required to monitor for nontarget species that may consume the bait. If nontarget species are observed, then the use of DRC-1339 would be postponed or not applied at that particular location. The application method such as the use of prebaiting to assess palatability of the bait and prevent overbaiting, and the low risk of secondary hazards reduce the potential exposure to sensitive threatened and endangered species as well as preclude hazards to most other non-target species

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-Nebraska 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-Nebraska is not likely to have an adverse effect on T&E species, especially because it will be used according to label restrictions and primarily in urban environments by WS-Nebraska.

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 sterilant 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 Nebraska before WS-Nebraska 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 Nebraska, the use of this bait would have no effect on T&E or sensitive species, people, pets, or the environment. WS-Nebraska has not used OvoControl™ G but could following registration with NDA. It is expected that this chemical would have minimal effect on the resident Canada goose population in Nebraska 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-Nebraska Only

Under this alternative, WS would be required to implement non-lethal methods only to resolve damage caused by birds in Nebraska. 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 NGPC, 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 NGPC 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 NGPC, 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-Nebraska 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.

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

Under this alternative, WS-Nebraska 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). Like 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 like 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 alleviating 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. Like 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. 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 NGPC, 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 act 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-Nebraska 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 NGPC, 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 discussion of these issues is given here and why they were not considered for detailed analysis.

3.4.1 Lethal BDM Only By WS

Under this alternative, WS-Nebraska 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-Nebraska 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 swift 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-Nebraska are coordinated with NGPC 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 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 into 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-Nebraska 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.

3.4.4 Bounties.

Bounties are payment of funds for killing birds suspected of causing losses. This alternative is not supported by wildlife and agricultural agencies such NGPC, NDA, and USFWS. WS-Nebraska does not have the authority to establish a bounty program and does not support this concept because:

- Bounties are generally not effective in reducing damage and it would be difficult to measure overall efficacy.
- Circumstances surrounding the bounty of birds are completely unregulated.
- There is a tendency for fraudulent claims to occur. It is difficult or impossible to prevent claims for birds taken from outside damage management areas.

3.4.5 Short Term Eradication and Long-Term Population Suppression.

In Nebraska, eradication of native bird species is not a desired population management goal of wildlife management agencies including WS-Nebraska. Although generally difficult to achieve, eradication of a local population of Pigeons or Starlings may be the goal of individual bird damage management projects. This could, in part, be because Pigeons and Starlings are not native to North America and are only present because of human introduction. However, eradication as a general strategy for reducing bird damage would not be considered in detail because:

- WS-Nebraksa opposes eradication of any native wildlife species.
- NGPC opposes the eradication of native Nebraska wildlife species.
- Eradication is not acceptable to most members of the public.
- Regional or statewide attempts at eradication of any native bird species would be next to impossible under the restrictions on methods and areas where bird damage management could be used in Nebraska.

Suppression would direct efforts toward managed reduction of targeted populations or groups of birds. In areas where damage could be attributed to localized populations, WS could decide to implement local population suppression, if supported by the WS Decision Model (Slate et al. 1992) and after consulting with the NGPC and/or USFWS. However, with the constraints on bird damage management methods, widespread population suppression would be difficult to maintain.

Problems with the concept of suppression are like those described above for eradication. It is not realistic or practical to consider large-scale population suppression as the basis of the WS program in Nebraska. Typically, WS-Nebraska activities in the State would be conducted on a very small portion of the sites or areas inhabited or frequented by the targeted species.

3.5 WS-Nebraska 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 Nebraska, 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-Nebraska's cooperating agencies (USFWS and NGPC) and can be found in the WS-Nebraska's 2017 Biological Assessmentwhich describing potential effects on T&E species and prescribing reasonable and prudent measures for avoiding jeopardy and corresponding 2018 BOs from the USFWS and NGPC(USDA 2018).

3.5.1 General Operating Policies Used by WS-Nebraska in BDM

- WS-Nebraska complies with all applicable laws and regulations that pertain to conducting BDM on private and public lands.

- WS-Nebraska coordinates with agency officials for work on public lands to identify and resolve any issues of concern with BDM.

- WS-Nebraska 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-Nebraska 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-Nebraska 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-Nebraska in deciding the most effective and economical strategies to resolve wildlife damage issues.

3.5.2 WS-Nebraska Operating Policies Specific to the Issues

The following is a summary of the Operating Policies used by WS-Nebraska 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-Nebraska personnel use specific trap types, lures, and placements that are most conducive for capturing the target animal.

- WS-Nebraska BDM take is monitored. Both "Total Harvest" and estimated population numbers of key species are used to assess cumulative effects of harvest. WS-Nebraska 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-Nebraska provides data on total take of target animal numbers to agencies (i.e., USFWS, NGPC) as appropriate.

- WS-Nebraska currently has agreements for BDM on less than 1% of the land area in Nebraska. 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-Nebraska will not impact bird species populations on more than 90% of the lands in Nebraska.

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

- WS-Nebraska 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-Nebraska 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-Nebraska 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-Nebraska 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 and Golden Eagles. Both eagle species are protected under the Bald and Golden Eagle Protection Act. If it is determined that either species could be affected by the proposed project, WS will notify the USFWS and NGPC, and obtain recommendations to avoid impacts to both species. If impacts to eagles are expected to occur, even if impacts are beneficial, WS will obtain permit authorization from the USFWS prior to conducting BDM activities

  Whooping Crane. WS-Nebraska employees will not use avicides in areas where Whooping Cranes could potentially be found. If whooping cranes are spotted, work will cease, and the WS will contact the USFWS Nebraska Field Office and NGPC.

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

- A formal risk assessment (USDA 2019) concluded that hazards to the public from BDM devices and activities are low.

- All pesticides are registered with EPA and NDA. WS-Nebraska employees will comply with each pesticide's directions and labeling, in addition to EPA and NDA rules and regulations.

- WS-Nebraska 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 NDA approved programs. WS-Nebraska 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-Nebraska personnel 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-Nebraska personnel when practical and where safe (WS Directive 2.401, 2.405).

- WS-Nebraska 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-Nebraska take is minimal compared with overall bird species populations, and, thus, does not impact the opportunity of the public to enjoy these species.

- WS-Nebraska 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-Nebraska 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 select the most appropriate alternative for WS-Nebraska 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 Nebraska 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-Nebraska 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 NGPC. NGPC 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 Effects of Alternative 1 on Target Bird Species Populations

Under the current program alternative, take by WS-Nebraska 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 Nebraska. This EA has been expanded to include all bird species in Nebraska 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-Nebraska 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 NGPC) 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-Nebraska's take of most birds in Nebraska is the fact that WS-Nebraska's involvement has no adverse effect on the *status quo* because, if WS-Nebraska was not available, under USFWS or NGPC authority, virtually the same birds that are killed by WS-Nebraska could be taken by other agency or private actions. This suggests that, if WS-Nebraska stopped its involvement in most bird management, there would be virtually no change in environmental effects or in cumulative environmental effects. Additionally, landowners 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 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 could recover from declines that might result from mistakes in management. History has born 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 Nebraska, 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-Nebraska 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-Nebraska personnel and incorporated by the resource owner.

WS-Nebraska 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-Nebraska 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-Nebraska 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-Nebraska conducted lethal BDM annually from FY15 to FY19 for 14 primary bird species in Nebraska but has the potential for dealing with many more species. WS-Nebraska took 44 species from FY15 to FY19 (Table 4). The species that cause damage are listed in Section 1.2 with general information about them and the agency, USFWS, NGPC, or WS-Nebraska, that has primary responsibility for responding to damage complaints involving them. The primary target species taken yearly in Nebraska are introduced commensal species (European starlings, feral pigeons, House Sparrows), Blackbirds (3 species as discussed), Canada Geese, Mallards, Cattle Egrets, Ring-billed Gulls, and Mourning Doves. Additionally, WS-Nebraska has taken only minimal numbers of 44 species. Of the annual take of birds from FY15 to FY19, 98.7% of the take were 3 introduced species: starlings (94%) and feral pigeons (4.5%) and house sparrows (.2%). Brown-headed Cowbirds, Canada Geese, mourning dove, and Franklin's gull combined for (.3%) of the total take and the remaining 37 species accounted for about 1% of WS-Nebraska's lethal take.

Table 4. Birds killed by WS-Nebraska in BDM from FY15 to FY19. Take was estimated for species killed with toxicants.

Species	FY15	FY16	FY17	FY18	FY19	Ave
			Introduced			
European Starling*	74,384	90,484	150,477	58,459	43,794	83,520
Feral (Rock) Pigeon*	2,242	4,266	5,707	3,850	3,758	3,965
House Sparrow*	252	179	138	120	243	186
			Blackbirds			
Red-winged Blackbird	2	1	2	50	10	13
Brown-headed Cowbird	343	5	78	363	39	166
Common Grackle	26	-	17	22	-	13
			Waterfowl			
Canada Goose	181	149	102	162	116	142
Snow Goose	1	1	-	2	-	1
Mallard	61	76	10	41	59	49
Northern Shoveler	-	-	-	15	-	4
Blue-winged Teal	27	15	-	11	16	14
Wood Duck	-	-	7	1	-	2
Muscovy Duck	-	2	-	-	-	1
Double-crested Cormorant	5	6	15	16	4	9
American Coot	2	-	5	5	-	2
			Wading Birds			
Cattle Egret	-	-	-	-	5	1
Least Sandpiper	-	-	-	4	-	1
Great Egret	2	-	-	2	1	1
Great Blue Heron	13	24	30	40	58	33
			Gulls			
Ring-billed Gull	11	11	17	17	10	13
Franklin's Gull	117	59	59	24	118	69
			Raptors			
Red-tailed Hawk	122	41	70	34	22	58
Cooper's Hawk	5	2	1	1	-	2
Turkey Vulture	16	20	36	26	33	26
Northern Harrier	4	1	1	-	3	2
Rough-Legged Hawk	-	-	1	-	2	1
American Kestrel	15	15	6	5	5	9
Owls						
Burrowing Owl	-	-	1	1	-	1
Great Horned Owl	5	-	1	4	2	2
			Misc. Birds			
Killdeer	87	45	71	7	16	45
American Robin	20	15	3	6	-	9
Mourning Dove	500	193	185	233	12	225
Eurasian Collared Dove	3	7	1	2	-	3
American Crow	2	1	1	15	-	4
Northern Flicker	1	-	-	-	-	
Cliff Swallow	205	92	5	-	-	60
Barn Swallow	50	21	6	32	68	35
Purple Martin		-	-	-	3	1
Eastern Kingbird	10	-	-	-	-	2
Western Kingbird	8	-	-	-	-	2

Eastern Meadowlark	4	6	-	-	-	2
Western Meadowlark	13	-	16	-	-	6
Pied-billed Grebe	-	-	-	3	-	1
Wild Turkey	12	18	41	21	32	25

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

WS-Nebraska uses several BDM methods that result in the lethal take of birds. The greatest number of birds are lethally taken with chemical methods (especially European Starlings). WS-Nebraska had 3 species birds taken with chemicals from FY15 to FY19, was DRC-1339. Table 3 (Section 2.1.3) gives the amount of chemical used by WS-Nebraska. 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-Nebraska 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-Nebraska. The other blackbirds were divided to species by the typical composition of birds found in Nebraska during the time of year the project took place.

WS-Nebraska (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-Nebraska 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 Nebraska, 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-Nebraska is of no significant impact on the human environment since they are not native components of ecosystems in Nebraska.

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 Nebraska. However, it must be noted that large numbers of starlings are 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 Nebraska 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 Nebraska 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 Nebraska.

Additionally, during winter months, when many BDM projects are conducted, an influx of starlings is seen in Nebraska 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 Nebraska has two or three times as many starlings coming into the state during winter from migration. However, not considering the migrant population, WS-Nebraska 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-Nebraska has averaged the take of about 83,520 starlings annually from FY15 to FY19. WS-Nebraska and other agencies do not keep data 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-Nebraska believes that other individuals or agencies might possibly take up to 250,000 starlings in control projects in Nebraska, primarily with shooting and Avitrol® and Starlicide Complete®, commercially available products for certified pesticide applicators.

WS-Nebraska 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-Nebraska average take of 83,520 starlings (FY15-FY19) represents 3.3% of the estimated breeding population and 2.2% of the post-fledgling population. WS-Nebraska take of 150,477 in FY 17 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-Nebraska has determined that WS-Nebraska has not added to a cumulative impact to the starling population. Take between years by WS-Nebraska mostly reflects the availability of WS-Nebraska 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-Nebraska program is of no significant impact on the human environment since starlings are not an indigenous component of ecosystems in Nebraska. 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 Nebraska from 2005 to 2015 at -2.3%/year (Sauer et al. 2017). The breeding feral pigeon population in Nebraska 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 Nebraska, pigeons can be found statewide throughout the year and are considered a common resident of the state.

WS-Nebraska takes minimal numbers of pigeons averaging 3,965 annually from FY15 to FY19 (WS-Nebraska takes less than 1.3% of the estimated state population). This would be a low magnitude of impact on the population.

Any BDM involving lethal control actions by WS-Nebraska 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 FY19 were minimal from WS-Nebraska BDM and we believe that the pigeon population in Nebraska 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 Nebraska from 2005 to 2015 at -2%/year (Sauer et al. 2017). However, the breeding population in Nebraska is still abundant. The breeding House Sparrow population in Nebraska could be estimated from BBS data (Sauer et al. 2017) using corrective parameters (Rich et al. 2004) at 3 million.

WS-Nebraska conducts minimal BDM for House Sparrows in Nebraska, averaging 186 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 Nebraska 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). Most 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 10) found 61 million breeding Red-winged and Yellow-headed Blackbirds, and Common Grackles (Table 5). Data from BBS indicate that the blackbird population (including with the 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 Nebraska later in the year. Therefore, it is probable that many of the blackbirds that winter in Nebraska 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 Nebraska come from a much broader area than just the northern Central Flyway region. This means that the mortality of blackbirds at Nebraska 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 Nebraska 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

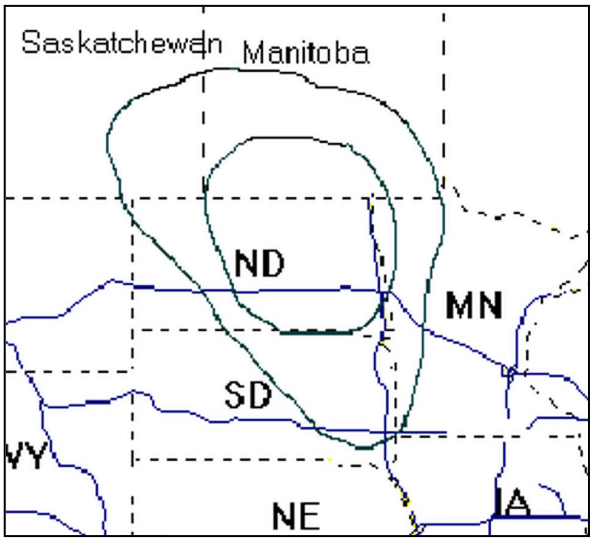

Figure 10. The Northern Prairie-Pothole region used by Peer et al. (2003) to make an estimate of the population of 3 blackbird species.

will be used to determine impacts to the various populations of blackbirds because it is likely that many birds come from the Central Flyway.

Table 5. 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-Nebraska personnel at several affected Nebraska feedlots where WS-Nebraska 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-Nebraska 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-Nebraska 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 Nebraska (-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/mi^2 (Appendix A: Table A1) for the Central Flyway region analyzed in this EA (Figure 4). NEWSP average take of 13 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 Nebraska (-0.7%). Brown-headed Cowbirds are still one of the most abundant species on the Nebraska Survey. Additionally, this is an abundant species in the Central Flyway and the population has been estimated at 20 million (Appendix A: Table A2). NEWSP

take of brown-headed cowbirds occurs primarily at airports. WS-Nebraska average annual take of 166 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). Nebraska 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 male 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-Nebraska take of common grackles is from BDM activities around airports and the average annual take of 13 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 Nebraska. 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 male 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-Nebraska take of great-tailed grackles occurs as a result of airport BDM and the average annual take of 13 (FY15-FY19) 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 Nebraska) 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 Nebraska have become more liberal.

Of the waterfowl species, the most significant increase has occurred with Canada Geese (Figure 11) 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-Nebraska 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).

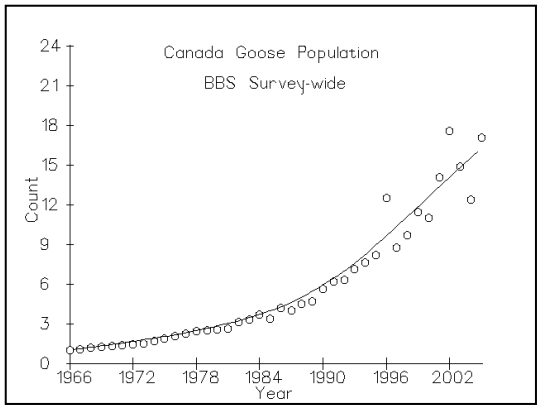

Figure 11. BBS survey-wide Canada Goose population trend (*from* Sauer et al. 2006).

WS-Nebraska killed 6 species of waterfowl from FY15 to FY19 but has the potential of taking several others (see Appendix A). WS-Nebraska primarily targets Canada geese (142 annual/average) Blue-winged teal (14 annual/average) and mallards (49 annual/average) around airports but also took 1 Snow goose, 15 Northern Shovelers, 7 Wood ducks, and 2 Muscoy ducks from FY15 to FY19. All 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, Nebraska waterfowl hunters took an average of

100,000 Mallards and 100,000 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-Nebraska concludes that none of the waterfowl take by WS-Nebraska has had the potential to negatively affect the waterfowl populations and does not anticipate such. WS-Nebraska 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 affect the overall population.

Wading Bird Impacts

Twenty species of wading birds are found in Nebraska (Appendix A). WS-Nebraska took 5 different species of wading birds (Table 4), egrets and herons, from FY15 to FY19. WS-Nebraska took an average of two or less Great Egret, Cattle Egret Pied-billed Grebe and Least Sandpiper annually from FY15 to FY19. All are common in the Central BBS area during the breeding season (a few on the edge of their range in Nebraska) and the take of one or less would not affect their populations. WS-Nebraska did take an average of 33 Great Blue Heron from FY15 to FY19, 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 Nebraska, 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 Nebraska is a nonsignificant positive increase during that time. Even with current control efforts, the population appears to have increased. Therefore, WS-Nebraska 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 of cattle egrets. WS-Nebraska'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-Nebraska' 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-Nebraska 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 Nebraska with most only migrating through Nebraska from northern breeding grounds. Two of these, the Ring-billed Gull and Franklin's Gull, have been taken in BDM activities by WS-Nebraska; from FY15 to FY19, WS-Nebraska took an average of 13 and 75, 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-Nebraska and other permitted activities elsewhere, have not had a negative impact on these species' populations. WS-Nebraska does not anticipate taking many more gulls than were taken from FY15 to FY19, and, at most, this could potentially be up to a hundred gulls per year. It is concluded that the minor take by WS-Nebraska has and will not influence the gull populations and WS-Nebraska 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 Nebraska and a species mostly involved in BDM at airports. The Eurasian Collared-Dove, a recent invasive species, has become more abundant in recient year, and although WS-Nebraska has only taken 3 Eurasian Collared-Doves fro FY15 to FY19, it will likely be a species involved in BDM at airports and other locations. 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 Nebraska 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 Nebraska 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 Nebraska (Sauer et al. 2017). It is becoming an abundant bird in many areas and often frequents altered or man-made habitats (Romagosa 2002). WS-Nebraska has taken an average of 1 Eurasian Collared-Doves from FY 16 to FY19 but anticipates that these birds 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-Nebraska BDM activities takes place at regional airports. WS-Nebraska takes, on average, about 225 doves per year from FY15 to FY19 (Table 4) much less than 0.05% of the annual harvest by hunters. Thus, WS-Nebraska has had a very minor impact on dove populations in Nebraska. The anticipated number of doves killed by WS-Nebraska will be so low in comparison to sport hunter harvest that WS-Nebraska will add to the cumulative harvest insignificantly.

Wild Turkey

With a turkey population that's exploded over the last decade in Nebraska, it's no secret turkeys can be found in every county in the state (NGPC 2020b). NEWSP took on average 24 wild turkeys from FY 2015 through FY 2019. Nebraska has a large and stable wild turkey population and the take of 24 birds primarily through control work at airports and property damage would have no impact on the statewide population. In comparison, Nebraska hunters took 18,131 turkeys in the 2019 spring season alone (NGPC 2019). Twenty-four turkeys taken on average by NEWSP represents 0.1% of the hunter harvest.

Swallows

NEWSP took an average of 35 barn and 60 cliff swallows from FY 2015 to FY 2019. Cliff and Barn swallows are abundant in Nebraska and the Central BBS area. BBS data indicate a significant increase of 4.6% from 1966-2015 and 7% increase in Nebraska from 2005-2015 (Sauer et al. 2017). Central BBS data also reflect this increasing trend. WS-Nebraska primarily takes cliff and barn swallows at airports to protect health and human safety and to protect property in hangars and parking garages. NEWSP take of cliff and barn swallows will have no cumulative impact on this species.

Impacts to Other Birds

WS-Nebraska takes few other birds, and very few of any one species. Many of the other birds (e.g., Red-tailed Hawks, Turkey Vultures, Least 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-Nebraska took an average of 58 Red-tailed Hawks, 62Turkey Vultures and 2 Northern Harriers from FY15 to FY19. WS-Nebraska also took two non-flocking shorebirds at airports, an average of 65 Killdeer from FY15 to FY19 and one Least Sandpipers total from FY15 to FY19. 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-Nebraska 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 FY19. NEWSP conducts BDM at 3 airports across the state and it is concluded that the minor take by WS-Nebraska has and will not influence the other species' populations.

WS-Nebraska did not lethally target any federally or state listed T&E species from FY15 to FY19 and does not anticipate such requests. This would only be done after obtaining the necessary permit for such an activity. Thus, WS-Nebraska concludes that impacts to T&E and sensitive species by WS-Nebraska have been minor to nonexistent.

Impacts on Bird Populations from Nonlethal Methods in BDM

WS-Nebraska hazed or captured and released or relocated at least 7 species and more than 850 birds from FY15 to FY19. ("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 FY16 to FY18 (Table 6). Of these, 7 species were primarily hazed annually in Nebraska (annually hazed >100 of a species from FY15 to FY19). However, WS-Nebraska could potentially conduct nonlethal BDM for many more species (Appendix B: Tables B1 and B3). Operationally, WS-Nebraska conducts most all hazing activities at airports where birds are an aviation strike hazard. The species that cause damage in Nebraska are listed in Section 1.2 with general information about them and which agency, USFWS, NGPC, or WS-Nebraska has primary responsibility for responding to damage complaints that involve these species. WS-Nebraska would conduct BDM for these species.

Table 6. Birds hazed (scared with frightening devices or other nonlethal method) from damage situations from FY15 to FY19 by WS-Nebraska.

Species	FY15	FY16	FY17	FY18	FY19	Ave
	Commensal					
European Starling*	4,220	20,825	6,804	7,555	10,785	10,040
Feral (Rock) Pigeon	183	234	15	15	158	121
House Sparrow	400	-	-	235	795	286
	Blackbirds					
Red-winged Blackbird	1,500	4,540	504	300	35	1,376
Yellow-headed Blackbird	-	-	-	-	2	1
Brown-headed Cowbird	287	590	1,139	2,710	700	1,085
Common Grackle	53	-	-	-	1,500	311
	Waterfowl					
Canada Goose	2,327	18,189	3,340	24,928	4,241	10,605
Snow Goose	-	6	-	201	2,501	542
Greater White Fr. Goose	-	60	75	-	-	27
Mallard	143	2,135	173	1,917	1,162	1,106
Double-crested Cormorant	204	165	8	987	170	307
American White Pelican	-	75	-	170	2,250	499
Blue-winged Teal	538	226	188	368	951	454
Green-winged Teal	-	-	50	24	50	25
Hooded Merganser	-	11	-	135	2	28
Common Goldeneye	154	1,190	410	472	150	475
Gadwall	103	394	226	208	55	197
Northern Shoveler	68	72	425	572	425	312
Bufflehead	-	7	54	17	37	23
Wood Duck	6	33	78	27	27	34
American Wigeon	25	80	30	39	5	36
Common Merganser	180	-	80	128	8	79
Red-breasted Merganser	15	-	-	30	-	9
Northern Pintail	2	190	-	-	-	38
Scaup	651	459	1,550	3,525	401	1,317
Redhead	-	28	-	8		7
Ring-Necked	192	441	21	413	50	223
Ruddy	-	5	-	19	-	5
Trumpeter Swan	-	-	38	-	-	8
Common Loon	-	-	-	3	-	1
	Wading Birds					
Cattle Egret	-	6	-	-	35	7
Great Egret	-	-	24	5	48	15
Great Blue Heron	58	84	51	107	204	101
Green Heron	-	1	-	1	-	1
American Coot	-	-	1	-	-	1
	Gulls					
Ring-billed Gull	1,564	869	854	5,451	6,151	2,978
Franklin's Gull	2,251	2,005	9,382	14,874	8,696	7,442
Bonaparte's Gull	-	50	-	1,150	-	240
Herring Gull	26	-	44		-	14
	Raptors					
Bald Eagle	2	5	-	3	3	3
Red-tailed Hawk	677	330	289	308	233	376
American Kestrel	40	56	18	23	3	28
Northern Harrier	17	12	16	30	9	17

Swainson's Hawk	1	3	47	35	-	17
Merlin	-	-	1	-	-	1
Cooper's Hawk	5	4	4	3	3	4
Peregine Falcons	-	-	1	-	2	1
Rough-legged Hwak	-	-	-	11	-	2
Sharp-Shinned Hawk	-	-	1	2	-	1
Turkey Vulture	1,188	589	726	692	422	723
Ospreys	-	-	-	2	3	1
Owls, (All)	2	-	1	9	-	2
	Shorebirds					
Killdeer	-	31	245	97	117	98
Upland Sandpiper	-	-	6	-	-	1
Least Sandpiper	-	6	-	80	-	17
	Miscellaneous					
American Crow	50	4	1	70	-	25
Mourning Dove	387	473	1,343	430	150	556
Eurasian Collared Dove	-	-	17	-	-	3
Cliff Swallow	-	100	520	-	-	124
Tree Swallow	-	-	-	-	700	140
Eastern Meadowlark	-	-	-	700	-	140
American Robin	24	-	15	7	-	9
Barn Swallow	5	200	400	8	364	195
Western Meadowlark	-	-	17	-	-	3
Ring-necked Pheasant	-	-	5	4	-	2
Purple Martin	6,600	200	1,650	-	250	1740
Wild Turkey	19	79	109	7	10	45
Western Kingbird	-	-	-	-	28	6
Black Tern	-	-	-	-	35	7

Harassment by WS-Nebraska 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 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-Nebraska averaged hazing about 44,663 birds annually from FY15 to FY19. WS-Nebraska conducted most hazing at airports to prevent airstrikes. WS-Nebraska 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 for American Kestrals, Cooper's and Red-tailed Hawks, Great Horned Owls and Wild Turkeys. WS-Nebraska 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 Effects of Alternative 2 on Target Bird Species Populations

Under this alternative, WS-Nebraska would not take any target species because lethal methods would not be used. Nonlethal activities conducted by WS-Nebraska 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, pigeons, and some birds would quickly become habituated to harassment techniques, and, thus, where lethal techniques would be implemented to reinforce hazing efforts, WS-Nebraska 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-Nebraska'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-Nebraska 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, like 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 Effects of Alternative 3 on Target Bird Species Populations

Under this alternative, WS-Nebraska would have no impact on any bird species population in Nebraska because the program would not conduct any operational BDM activities. WS-Nebraska 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 like, 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-Nebraska 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 Effects of Alternative 4 on Target Bird Species Populations.

Under this alternative, WS-Nebraska would have no impact on any bird species populations in Nebraska. Private efforts to reduce or prevent depredations would increase which would result in impacts on target species populations like 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-Nebraska 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-Nebraska, 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 brown-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.

WS-Nebraska takes every precaution to mitigate the possibility of a nontarget species being affected by BDM (USFWS 2018). 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 Effects of Alternative 1 on Nontarget Species Populations, Including T&E Species

WS-Nebraska did not take any nontarget species during BDM activities from FY15 to FY19. 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-Nebraska. 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-Nebraska did not document any such occurrences from FY15 to FY19.

WS-Nebraska 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-Nebraska does not anticipate that populations of either species has been affected by BDM. BDM for these species would have to be focused during the nesting period when and where WS-Nebraska 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 Nebraska). 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-Nebraska 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-Nebraska has not had an impact on any federally listed T&E or candidate species (Table 2) in Nebraska, including the Whooping Crane, from FY15 to FY19. 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 Nebraska 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-Nebraska has not had any impacts on them from FY15 to FY19. WS-Nebraska does anticipate that BDM will have more than a minor impact on any such species.

4.1.2.2 Effects of Alternative 2 on Nontarget Species Populatons, Including T&E Species

Under this alternative, WS-Nebraska 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 is lower probability of take than BDM methods that could be used under the proposed action. However, WS-Nebraska did not take any nontarget species from FY15 to FY19, 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 Effects of Alternative 3 on Nontarget Sprcies Populations, Including T&E Species

Alternative 3 would not allow WS-Nebraska to conduct any direct operational BDM in Nebraska and, therefore, WS-Nebraska 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-Nebraska 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 Effects of Alternative 4 on Nontarget Species Populations, Includig T&E Species

Alternative 4 would not allow WS-Nebraska to conduct any BDM in the State. Nontarget take by WS-Nebraska would be negated under this alternative. However, parties with bird damage problems would likely resort to other means. There would be no impact on nontarget or T&E species by WS-Nebraska 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-Nebraska would not provide assistance with BDM and, therefore, would not have an effect on nontarget, T&E, or sensitive species. NGPC 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-Nebraska'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-Nebraska, 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). WS-Nebraska incorporates operating policies covered in (Section 3.5) 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. BDM methods must be legal and biologically sound. Following is a discussion of the potential impacts from BDM on the public, pets and the environment for each Alternative.

4.1.3.1 Effects of Alternative 1 on Public and Pet Safety and the Environment.

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-Nebraska 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-Nebraska when conducting BDM and WS-Nebraska complies with all applicable laws and regulations governing the lawful use of firearms (USDA 2018).

The USDA-APHIS-Wildlife Services (WS) Program uses firearms to kill, capture, and disperse animals for specific wildlife management projects, mostly where a need exists to resolve a wildlife damage situation. Wildlife can cause damage to property, agriculture, and natural resources or cause human health and safety concerns; for example, firearms are used to reduce wildlife hazards at airports or collect wildlife for disease surveillance. WS uses firearms frequently for wildlife damage management operations. Firearms are used in all types of settings, including urban and rural areas, by employees who are trained and certified in the safe use of firearms in accordance with WS Directive 2.615. Potential human health and environmental risks from the proposed use of all types of firearms, including rifles, handguns, shotguns, and other firearm-like and ancillary devices, by WS has been evaluated by APHIS and determined that the risks to human health and the environment are negligible. Shooting is a target specific method and only has a minimal risk to people, pets, and nontarget species. WS personnel are trained and certified to use firearms to ensure operations are conducted safely. To ensure safe firearm use and awareness, WS employees who use firearms to conduct official duties are required to attend an approved firearms safety training, currently the National Rifle Association curriculum for basic pistol, rifle, or shotgun certification, before they can use firearms or firearm-like devices in their jobs; additionally, refresher training is required, thereafter (WS Firearms Manual and WS Directive 2.615). Further, WS employees who carry firearms, as a condition of employment, are required to verify that they meet the criteria as set forth in the Lautenberg Amendment, which prohibits firearm possession by anyone who has been convicted of a misdemeanor crime of domestic violence. The risk of a stray bullet inadvertently striking nontarget wildlife, an individual, or pet is virtually eliminated by WS precautionary measures, such as positively identifying target animals before shooting, ensuring a safe backstop is present should the bullet or shot miss, using rifles or shotguns that fire a single shot or load, using the correct firearm and ammunition for the situation, and using only specially trained personnel. The use of lead in ammunition is covered in the Lead Risk Assessment specifically (USDA 2019c).

WS-Nebraska also follows safety precautions and WS Policies when using pyrotechnics.

USDA-APHIS-Wildlife Services (WS) Program uses cage traps to capture a variety of vertebrate animals for specific wildlife management projects, mostly where a need exists to resolve a wildlife damage situation. Wildlife can cause damage to property, agriculture, and natural resources or cause human health and safety concerns; for example, cage traps may be used to capture a skunk that is under a house or a for disease surveillance. WS uses cage traps extensively for wildlife damage management operations. Cage traps are used in many settings including urban and rural areas. WS personnel use cage traps in accordance with WS Directive 2.450.

Potential human health and environmental risks from the proposed use of all types of cage traps including purse and box traps, and drive or herd style cage traps by WS has been evaluated by APHIS and determined that the risks to human health and the environment are negligible. Cage traps can capture nontarget species, but capture rates are low compared to overall take and nontarget species are often released from cage traps unharmed. Cage traps have minimal risks to people, pets, and nontarget species. WS will continue to support and conduct research and education that supports more humane and effective

trapping methods and will implement these measures in programs, where appropriate, to further reduce risk to nontarget animals.

WS-Nebraska 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-Nebraska personnel that use avian toxicants are certified through NDA. Two toxicants are used in BDM, DRC-1339 and Avitrol®. Immobilization and euthanasia drugs are used only by WS-Nebraska personnel trained and certified to use them. WS-Nebraska 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 Nebraska. USDA (2019) 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-Nebraska used an average of about 1,289 grams of DRC-1339 from FY15 to FY19. 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 (2019a) 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 require 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-Nebraska in BDM. WS-Nebraska used no Avitrol from FY15 to FY19 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.

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-Nebraska. 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 require 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-Nebraska 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 nicarbazin (OvoControlTM 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.

WS formal Risk Assessmentsconcluded 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 2019). WS-Nebraska did not have any incidents involving the public or pets conducting BDM from FY15 to FY19.

Thus, WS-Nebraska poses minimal risks to public and pet health and safety when implementing BDM. In fact, WS-Nebraska can reduce public safety hazards. Many WS-Nebraska 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 Effects of Alternative 2 on Public and Pet Safety and the Environment

Alternative 2 would not allow for any lethal methods use by WS-Nebraska. WS-Nebraska 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-Nebraska 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-Nebraska'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-Nebraska's assistance than under Alternative 1. Use of these chemicals in accordance with label requirements should prevent 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-Nebraska'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 Effects Alternative 3 on Public and Pet Safety and the Environment

Alternative 3 would not allow any direct operational BDM assistance by WS-Nebraska in the State. WS-Nebraska 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-Nebraska implementing BDM under this alternative would be nullified.

Additionally, DRC-1339 is only registered for use by WS-Nebraska 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-Nebraska, people, pets, and the environment may not be as at great a risk compared to persons using hazardous BDM methods with no instruction, like that discussed under Alternative 2. NGPC may provide some services and risks from BDM method use would be like 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-Nebraska'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-Nebraska'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 Effects of Alternative 4 on Public and Pet Safety and the Environment

Alternative 4 would not allow WS-Nebraska or any other federal agency to conduct BDM in the State. Therefore, concerns about risks to people, pets, and the environment from WS-Nebraska would be nullified. In addition, DRC-1339 is registered for use only for WS-Nebraska personnel, would not be available for use by private individuals. NGPC possibly could provide some level of professional BDM, and their actions and associated risks would be like 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-Nebraska'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 several lands 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 like 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 Effects of Alternative 1 on Aesthetics

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-Nebraska 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-Nebraska 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 birds that would be killed by WS-Nebraska'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-Nebraska'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 causes 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-Nebraska 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 Effects of Alternative 2 on Aesthetics

Under this alternative, WS-Nebraska 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-Nebraska'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-Nebraska which means the impacts would then be like the current program alternative.

Under this alternative, WS-Nebraska 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 Effects of Alternative 3 on Aesthetics

Under this alternative, WS-Nebraska 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-Nebraska 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-Nebraska activities under this alternative because the individual birds would not be killed or harassed by WS-Nebraska. However, other private entities would likely conduct similar BDM activities as those that would no longer be conducted by WS-Nebraska which means the impacts would then be like 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-Nebraska'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-Nebraska has only provided technical assistance to 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-Nebraska 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 Effects of Alternative 4 on Aesthetics

Under this alternative, WS-Nebraska 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-Nebraska under this alternative. However, other private entities would likely conduct similar BDM activities as those that would no longer be conducted by WS-Nebraska which means the impacts would then be like 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-Nebraska 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 BDM 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 7. The current program alternative provides the lowest overall negative environmental consequences combined with the highest positive effects.

Table 7. 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 Nebraska 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 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 Nebraska 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 Nebraska 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 bait 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 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 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-Nebraska 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 Nebraska at feedlots, dairies, and other resource areas while NEWSP 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-head 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 like 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-Nebraska in Nebraska 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 must 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. If 1,300 kernels equal one pound and are treated, each kernel would have about 3.5 mg DRC-1339 (prior to being cut with untreated baits). The oral LD_{50} 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-Nebraska 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-Nebraska in BDM for House Sparrows, starlings, pigeons, and blackbirds in Nebraska 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-Nebraska 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-Nebraska 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-Nebraska 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 if 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-Nebraska'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 Nebraska, 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 Nebraska

Table 1. Common and scientific names are given for the bird species common in Nebraska that have the potential of being the target of a BDM project. Many bird species in Nebraska 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]	*Cygnus buccinator*
Greater White-fronted Goose[2]	*Anser albifrons*
Snow Goose[2]	*Chen caerulescens*
Ross' Goose[2]	*Chen rossii*
Cackling Goose[2]	*Branta hutchinsii*
Canada Goose[2,4,5,6]	*Branta canadensis*
Wood Duck[2]	*Aix sponsa*
Green-winged Teal	*Anas crecca*
American Black Duck	*Anas rubripes*
Mallard[2,4,5,6]	*Anas platyrhynchos*
Northern Pintail	*Anas acuta*
Blue-winged Teal	*Anas discors*
Cinnamon Teal	*Anas cyanoptera*
Northern Shoveler	*Anas clypeata*
Gadwall	*Anas strepera*
American Wigeon[6]	*Anas americana*
Canvasback	*Aythya valisineria*
Redhead	*Aythya americana*
Ring-necked Duck[1]	*Aythya collaris*
Greater Scaup	*Aythya marila*
Lesser Scaup	*Aythya affinis*
Common Goldeneye[1]	*Bucephala clangula*
Bufflehead[1]	*Bucephala albeola*
Hooded Merganser[1]	*Lophodytes cucullatus*
Common Merganser[1]	*Mergus merganser*
Red-breasted Merganser[1]	*Mergus serrator*
Ruddy Duck	*Oxyura jamaicensis*
Order Galliformes – Pheasants, Grouse, Turkeys, and Quail	
Ring-necked Pheasant[2]	*Phasianus colchicus*
Greater Prairie-Chicken	*Tympanuchus cupido*
Wild Turkey[2]	*Meleagris gallopavo*
Northern Bobwhite[2]	*Colinus virginianus*
Family Gavidae - Loons	
Common Loon[1 SMC]	*Gavia immer*
Family Podicipedidae - Grebes	
Pied-billed Grebe[1]	*Podilymbus podiceps*
Horned Grebe[1]	*Podiceps auritus*
Eared Grebe[1]	*Podiceps nigricollis*
Western Grebe[1]	*Aechmophorus occidentalis*
Clark's Grebe[1]	*Aechmophorus clarkii*
Order Pelicaniformes – Pelicans, Cormorants, and Allies	
American White Pelican[1]	*Pelecanus erythrorhynchos*
Double-crested Cormorant[1]	*Phalacrocorax auritus*
Order Ciconiiformes – Egrets, Herons, and Ibises	
American Bittern[1 SMC]	*Botaurus lentiginosus*
Least Bittern	*Ixobrychus exilis*
Great Blue Heron[1]	*Ardea herodias*
Great Egret[1,4,6]	*Casmerodius albus*
Snowy Egret[1,4,6]	*Egretta thula*
Little Blue Heron[1,4,6]	*Egretta caerulea*

Species	*Scientific Name*
Cattle Egret[1,4,6]	*Bubulcus ibis*
Green Heron[1]	*Butorides striatus*
Black-crowned Night-Heron[1,4,6]	*Nycticorax nycticorax*
Yellow-crowned Night-Heron[1]	*Nyctanassa violacea*
White Ibis	*Eudocimus albus*
White-faced Ibis SMC	*Plegadis chihi*
Order Falconiformes – Vultures, Hawks, and Kites	
Turkey Vulture[3,4,6]	*Cathartes aura*
Mississippi Kite[4]	*Ictinia mississippiensis*
Bald Eagle*	*Haliaeetus leucocephalus*
Northern Harrier SMC	*Circus cyaneus*
Sharp-shinned Hawk[3]	*Accipiter striatus*
Cooper's Hawk[3]	*Accipiter cooperii*
Red-shouldered Hawk	*Buteo lineatus*
Broad-winged Hawk	*Buteo platypterus*
Swainson's Hawk	*Buteo swainsoni*
Red-tailed Hawk[3]	*Buteo jamaicensis*
Ferruginous Hawk SMC	*Buteo regalis*
Rough-legged Hawk	*Buteo lagopus*
Golden Eagle[3] SNC	*Aquila chrysaetos*
American Kestrel	*Falco sparverius*
Merlin	*Falco columbarius*
Prairie Falcon	*Falco mexicanus*
Peregrine Falcon **	*Falco peregrinus*
Order Gruiformes – Rails and Cranes	
American Coot[6]	*Fulica americana*
Sandhill Crane[2]	*Grus canadensis*
Whooping Crane*	*Grus americana*
Order Charadriiformes (excluding Laridae)– Shorebirds	
Black-bellied Plover	*Squatarola squatarola*
American Golden-Plover	*Pluvialis dominica*
Snowy Plover **	*Charadrius alexandrinus*
Semipalmated Plover	*Charadrius semipalmatus*
Piping Plover*	*Charadrius melodus*
Killdeer	*Charadrius vociferus*
Mountain Plover SMC	*Charadrius montanus*
Black-necked Stilt	*Himantopus mexicanus*
American Avocet	*Recurvirostra americana*
Greater Yellowlegs	*Tringa melanoleuca*
Lesser Yellowlegs	*Tringa flavipes*
Solitary Sandpiper	*Tringa solitaria*
Willet	*Catoptrophorus semipalmatus*
Spotted Sandpiper	*Actitus macularia*
Upland Sandpiper SMC	*Bartramia longicauda*
Whimbrel	*Numenius phaeopus*
Long-billed Curlew SMC	*Numenius americanus*
Hudsonian Godwit	*Limosa haemastica*
Marbled Godwit	*Limosa fedoa*
Ruddy Turnstone	*Arenaria interpres*
Red Knot	*Calidris canutus*
Sanderling	*Calidris alba*
Semipalmated Sandpiper	*Calidris pusilla*
Western Sandpiper	*Calidris mauri*
Least Sandpiper	*Calidris minutilla*
White-rumped Sandpiper	*Calidris fuscicollis*
Baird's Sandpiper	*Calidris bairdii*
Pectoral Sandpiper	*Calidris melanotos*
Dunlin	*Calidris alpina*
Stilt Sandpiper	*Calidris himantopus*
Buff-breasted Sandpiper	*Tryngites subruficollis*
Short-billed Dowitcher	*Limnodromus griseus*
Long-billed Dowitcher	*Limnodromus scolopaceus*
Wilson's Snipe	*Gallinago delicata*

Species	***Scientific Name***
American Woodcock	*Scolopax minor*
Wilson's Phalarope	*Phalaropus tricolor*
Red-necked Phalarope	*Phalaropus lobatus*
Family Laridae – Gulls and Terns	
Franklin's Gull[1,4]	*Larus pipixcan*
Bonaparte's Gull[1,4]	*Larus philadelphia*
Ring-billed Gull[1,4,6]	*Larus delawarensis*
Herring Gull[1,4]	*Larus argentatus*
Caspian Tern[1]	*Sterna caspia*
Common Tern[1]	*Sterna hirundo*
Forster's Tern[1]	*Sterna forsteri*
Least Tern*	*Sterna antillarum*
Black Tern[1 SMC]	*Childonias niger*
Family Columbidae – Doves and Pigeons	
Rock Pigeon[2,3,4,5,6]	*Columba livia*
Mourning Dove	*Zenaida macroura*
Eurasian Collared-Dove[6]	*Streptopelia decaocto*
Order Strigiformes - Owls	
Common Barn Owl[4,6 SMC]	*Tyto alba*
Great Horned Owl[3]	*Bubo virginianus*
Burrowing Owl [SMC]	*Athene cunicularia*
Barred Owl[3]	*Strix varia*
Long-eared Owl	*Asio otus*
Short-eared Owl [SMC]	*Asio flammeus*
Family Caprimulgiformes - Goatsuckers	
Common Nighthawk	*Chordeiles minor*
Family Apodidae - Swifts	
Chimney Swift[4,6]	*Chaetura pelagica*
Family Alcedinidae - Kingfishers	
Belted Kingfisher[1]	*Ceryle alcyon*
Family Picidae - Woodpeckers	
Red-headed Woodpecker[2,6 SMC]	*Melanerpes erythrocephalus*
Red-bellied Woodpecker[2]	*Melanerpes carolinus*
Yellow-bellied Sapsucker[2,6]	*Sphyrapicus varias*
Ladder-backed Woodpecker[2 SNC]	*Picoides scalaris*
Downy Woodpecker[2]	*Picoides pubescens*
Hairy Woodpecker[2]	*Picoides villosus*
Northern Flicker[2,6]	*Colaptes auratus*
Pileated Woodpecker[2]	*Dryocopus pileatus*
Family Tyrannidae - Flycatchers	
Eastern Phoebe	*Sayornis phoebe*
Say's Phoebe	*Sayornis saya*
Great Crested Flycatcher	*Myiarchus crinitus*
Cassin's Kingbird	*Tyrannus vociferans*
Western Kingbird	*Tyrannus verticalis*
Eastern Kingbird	*Tyrannus tyrannus*
Scissor-tailed Flycatcher	*Tyrannus forficatus*
Family Alaudidae - Larks	
Horned Lark	*Eremophila alpestris*
Family Hirundinidae - Swallows	
Purple Martin[6]	*Progne subis*
Tree Swallow	*Tachycineta bicolor*
Northern Rough-winged Swallow	*Stelgidopteryx serripennis*
Bank Swallow	*Riparia riparia*
Cliff Swallow[6]	*Hirundo pyrrhonota*
Barn Swallow[3,6]	*Hirundo rustica*
Family Corvidae – Crows and Jays	
Blue Jay[2,4,6]	*Cyanocitta cristata*
Black-billed Magpie[2,3,4,6]	*Pica hudsonia*
American Crow[2,3,4,6]	*Corvus brachyrhynchos*
Fish Crow[2]	*Corvus ossifragus*
Chihuahuan Raven[2,3,4,5,6 SNC]	*Corvus cryptoleucus*
Common Raven[2,3,4,5,6]	*Corvus corax*

Species	*Scientific Name*
Family Turdidae – Robins and Thrushes	
American Robin[2]	*Turdus migratorius*
Family Mimidae – Mockingbirds and Thrashers	
Northern Mockingbird[4]	*Mimus polyglottos*
Family Motacillidae - Pipits	
American Pipit	*Anthus rubescens*
Sprague's Pipit SMC	*Anthus spragueii*
Family Bombycillidae - Waxwings	
Cedar Waxwing[2]	*Bombycilla cedrorum*
Family Laniidae - Shrikes	
Northern Shrike	*Lanius excubitor*
Loggerhead Shrike SMC	*Lanius ludovicianus*
Family Sturnidae - Starlings	
European Starling[2,3,4,5,6]	*Sturnus vulgaris*
Family Fringillidae –Sparrows and Finches	
Northern Cardinal[4]	*Cardinalis cardinalis*
Dickcissel SMC	*Spiza americana*
McCown's Longspur SMC	*Calcarius mccownii*
Lapland Longspur	*Calcarius lapponicus*
Snow Bunting	*Plectrophenax nivalis*
Bobolink SNC	*Dolichonyx oryzivorus*
Purple Finch	*Carpodacus purpureus*
House Finch[2,4,,6]	*Carpodacus mexicanus*
American Goldfinch	*Carduelis tristis*
Family Icteridae – Blackbirds and Meadowlarks	
Red-winged Blackbird[2,3,6]	*Agelaius phoeniceus*
Eastern Meadowlark SMC	*Sturnella magna*
Western Meadowlark	*Sturnella neglecta*
Yellow-headed Blackbird[2,3]	*Xanthocephalus xanthocephalus*
Rusty Blackbird[2,3,6]	*Euphagus carolinus*
Brewer's Blackbird[2,3,6]	*Euphagus cyanocephalus*
Great-tailed Grackle[2,3,4,6]	*Quiscalus mexicanus*
Common Grackle[2,3,6]	*Quiscalus quiscula*
Brown-headed Cowbird[2,3,5,6]	*Molothrus ater*
Family Ploceidae – Weaver Finches	
House Sparrow[2,3,4,6]	*Passer domesticus*

1 = Aquaculture; 2 = Crops; 3 = Livestock and feed; 4= Human Health and Safety; 5 = Natural resources; 6 = Property
* = Federally Listed T&E species ** = Nebraska 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 Nebraska that have little or no potential to be the target of a BDM project including BDM projects at airports.

Species	***Scientific Name***
Virginia Rail	*Rallus limicola*
Sora	*Porzana carolina*
Black-billed Cuckoo	*Coccyzus erythropthalmus*
Yellow-billed Cuckoo	*Coccyzus americanus*
Eastern Screech-Owl	*Otus asio*
Ruby-throated Hummingbird	*Archilochus colubris*
Olive-sided Flycatcher SMC	*Contopus borealis*
Western Wood-Pewee	*Contopus sordidulus*
Eastern Wood-Pewee	*Contopus virens*
Yellow-bellied Flycatcher	*Empidonax flaviventris*
Acadian Flycatcher	*Empidonax virescens*
Alder Flycatcher	*Empidonax alnorum*
Willow Flycatcher	*Empidonax traillii*
Least Flycatcher	*Empidonax minimus*
Bell's Vireo	*Vireo bellii*
Blue-headed Vireo	*Vireo solitarius*
Yellow-throated Vireo	*Vireo flavifrons*
Warbling Vireo	*Vireo gilvus*
Red-eyed Vireo	*Vireo olivaceus*
Black-capped Chickadee	*Parus atricapillus*
Tufted Titmouse	*Parus bicolor*
Red-breasted Nuthatch	*Sitta canadensis*
White-breasted Nuthatch	*Sitta carolinensis*
Brown Creeper	*Certhia americana*
Rock Wren	*Salpinctes obsoletus*
Carolina Wren	*Thryothorus ludovicianus*
House Wren	*Troglodytes aedon*
Winter Wren	*Troglodytes troglodytes*
Sedge Wren SMC	*Cistothorus platensis*
Marsh Wren	*Cistothorus palustris*
Golden-crowned Kinglet	*Regulus satrapa*
Ruby-crowned Kinglet	*Regulus calendula*
Blue-gray Gnatcatcher	*Polioptila caerulea*
Eastern Bluebird	*Sialia sialis*
Mountain Bluebird	*Sialia currucoides*
Townsend's Solitaire	*Myadestes townsendi*
Veery SMC	*Catharus fuscescens*
Gray-cheeked Thrush	*Catharus mimimus*
Swainson's Thrush	*Catharus ustulatus*
Hermit Thrush	*Catharus guttatus*
Wood Thrush	*Hylocichla mustelina*
Gray Catbird	*Dumetella carolinensus*
Brown Thrasher	*Toxostoma rufum*
Bohemian Waxwing	*Bombycilla garrulus*
Tennessee Warbler	*Vermivora peregrina*
Orange-crowned Warbler	*Vermivora celata*
Nashville Warbler	*Vermivora ruficapilla*
Northern Parula	*Parula americana*
Yellow Warbler	*Dendroica petechia*
Chestnut-sided Warbler	*Dendroica pensylvanica*
Magnolia Warbler	*Dendroica magnolia*
Yellow-rumped Warbler	*Dendroica coronata*
Blackburnian Warbler	*Dendroica fusca*
Yellow-throated Warbler SNC	*Dendroica dominica*
Palm Warbler	*Dendroica palmarum*
Bay-breasted Warbler	*Dendroica castanea*
Blackpoll Warbler	*Dendroica striata*
Black-and-white Warbler	*Mniotilta varia*
American Redstart	*Setophaga ruticilla*
Ovenbird	*Seiurus aurocapillus*
Northern Waterthrush	*Seiurus noveboracensis*
Kentucky Warbler	*Oporornis formosus*
Mourning Warbler	*Oporornis philadelphia*

Wilson's Warbler	*Wilsonia pusilla*
Canada Warbler	*Wilsonia canadensis*
Yellow-breasted Chat	*Icteria virens*
Summer Tanager	*Piranga rubra*
Scarlet Tanager	*Piranga olivacea*
Rose-breasted Grosbeak	*Pheucticus ludovicianus*
Black-headed Grosbeak	*Pheucticus melanocephalus*
Blue Grosbeak	*Guiraca caerulea*
Lazuli Bunting	*Passerina amoena*
Indigo Bunting	*Passerina cyanea*
Eastern Towhee	*Pipilo erythrophthalmus*
Spotted Towhee	*Pipilo maculatus*
American Tree Sparrow	*Spizella arborea*
Chipping Sparrow	*Spizella passerina*
Clay-colored Sparrow	*Spizella pallida*
Field Sparrow	*Spizella pusilla*
Vesper Sparrow	*Pooecetes gramineus*
Lark Sparrow	*Chondestes grammacus*
Lark Bunting SMC	*Calamospiza melanocorys*
Grasshopper Sparrow SMC	*Ammodramus savannarum*
Le Conte's Sparrow	*Ammodramus leconteii*
Nelson's Sharp-tailed Sparrow	*Ammodramus nelsoni*
Fox Sparrow	*Passerella iliaca*
Song Sparrow	*Melospiza melodia*
Lincoln's Sparrow	*Melospiza lincolnii*
Swamp Sparrow	*Melospiza georgiana*
White-throated Sparrow	*Zonotrichia albicollis*
White-crowned Sparrow	*Zonotrichia leucophrys*
Harris' Sparrow	*Zonotrichia querula*
Dark-eyed Junco	*Junco hyemalis*
Smith's Longspur	*Calcarius pictus*
Chestnut-collared Longspur SMC	*Calcarius ornatus*
Orchard Oriole	*Icterus spurius*
Baltimore Oriole	*Icterus galbula*
Bullock's Oriole	*Icterus bullockii*
Red Crossbill	*Loxia curvirostra*
Pine Siskin	*Carduelis pinus*
Evening Grosbeak	*Coccothraustes vespertinus*

* = Federally Listed T&E species
SMC = Species of Management Concern (USFWS 1995)
SNC = Species in Need of Conservation (NGPC 2020a)

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Table 3. Common and scientific names are given for the bird species that have been infrequently or accidentally seen in Nebraska. Also included are species that hypothetically (H) could be seen in Nebraska. 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 Nebraska. Shaded species are not likely to ever be the focus of a BDM project.

Species	***Scientific Name***
Red-throated loon	*Gavia stellata*
Pacific Loon	*Gavia pacifica*
Yellow-billed Loon	*Gavia adamsii*
Red-necked Grebe	*Podiceps grisegena*
Brown Pelican*	*Pelecanus occidentalis*
Neotropic Cormorant	*Phalacrocorax brasilianus*
Anhinga	*Anhinga anhinga*
Magnificent Frigatebird	*Fregata magnificens*
Tricolored Heron	*Egretta tricolor*
Reddish Egret	*Egretta rufescens*
Glossy Ibis	*Plegadis falcinellus*
Roseate Spoonbill	*Ajaia ajaja*
Wood Stork	*Mycteria americana*
Fulvous Whistling-Duck	*Dendrocygna bicolor*
Black-bellied Whistling-Duck	*Dendrocygna autumnalis*
Brant	*Branta bernicla*
Mottled Duck	*Anas fulvigula*
Garganey	*Anas querquedula*
Eurasian Wigeon (H)	*Anas penelope*
Tufted Duck (H)	*Aythya fuligula*
King Eider	*Somateria spectabilis*
Common Eider	*Somateria mollissima*
Harlequin Duck	*Histrionicus histrionicus*
Barrow's Goldeneye	*Bucephala islandica*
Long-tailed Duck	*Clangula hyemalis*
Black Scoter	*Melanitta nigra*
Surf Scoter	*Melanitta perspicillata*
White-winged Scoter	*Melanitta fusca*
Black Vulture	*Coragyps atratus*
Osprey	*Pandion haliaetus*
Swallow-tailed Kite	*Elanoides forficatus*
White-tailed Kite	*Elanus leucurus*
Northern Goshawk SMC	*Accipiter gentilis*
Harris' Hawk	*Parabuteo unicinctus*
Gyrfalcon	*Falco rusticolus*
Ruffed Grouse	*Bonasa umbellus*
Sharp-tailed Grouse	*Tympanuchus phasianellus*
Curlew Sandpiper	*Calidris ferruginea*
Ruff	*Philomachus pugnax*
Red Phalarope	*Phalaropus fulicaria*
Pomarine Jaeger	*Stercorarius pomarinus*
Parasitic Jaeger	*Stercorarius parasiticus*
Long-tailed Jaeger	*Stercorarius longicaudus*
Laughing Gull	*Larus atricilla*
Little Gull	*Larus minutus*
Black-headed Gull	*Larus ridibundus*
Mew Gull	*Larus canus*
California Gull	*Larus californicus*
Iceland Gull	*Larus glaucoides*
Lesser Black-backed Gull	*Larus fuscus*
Glaucous-winged Gull (H)	*Larus glaucescens*
Glaucous Gull	*Larus hyperboreus*
Great Black-backed Gull	*Larus marinus*
Black-legged Kittiwake	*Rissa tridactyla*
Sabine's Gull	*Xema sabini*
Arctic Tern (H)	*Sterna paradisaea*
Band-tailed Pigeon	*Columba fasciata*
White-winged Dove	*Zenaida asiatica*
Inca Dove	*Scardafella inca*
Common Ground-Dove	*Columbina passerina*
Groove-billed Ani	*Crotophaga sulcirostris*
Snowy Owl	*Nyctea scandiaca*

Species	*Scientific Name*
Common Poorwill	*Phalaenoptilus nuttallii*
White-throated Swift	*Aeronautes saxatilis*
Black-chinned Hummingbird	*Archilochus alexandri*
Broad-billed Hummingbird	*Cynanthus latirostris*
Costa's Hummingbird	*Calypte costae*
Anna's Hummingbird	*Calypte anna*
Calliope Hummingbird	*Stellula calliope*
Broad-tailed Hummingbird	*Selasphorus platycercus*
Rufous Hummingbird	*Selasphorus rufus*
Lewis' Woodpecker	*Melanerpes lewis*
Red-naped Sapsucker	*Sphyrapicus nuchalis*
Williamson's Sapsucker	*Sphyrapicus thyroideus*
Hammond's Flycatcher	*Empidonax hammondii*
Dusky Flycatcher	*Empidonax oberholseri*
Gray Flycatcher SMC	*Empidonax wrightii*
Cordilleran Flycatcher	*Empidonax occidentalis*
Vermillion Flycatcher	*Pyrocephalus rubinus*
Ash-throated Flycatcher	*Myiarchus cinerascens*
Violet-green Swallow	*Tachycineta thalassina*
Cave Swallow	*Hirundofulva*
Steller's Jay	*Cyanocitta stelleri*
Pinyon Jay	*Gymnorhinus cyanocephalus*
Juniper Titmouse (H)	*Parus ridgwayi*
Pygmy Nuthatch	*Sitta pygmaea*
Brown-headed Nuthatch	*Sitta pusilla*
Varied Thrush	*Ixoreus naevius*
Plumbeous Vireo	*Vireo plumbeus*
Cassin's Vireo	*Vireo cassinii*
Virginia's Warbler SMC	*Vermivora virginiae*
Cape May Warbler	*Dendroica tigrini*
Black-throated Gray Warbler	*Dendroica nigrescens*
Townsend's Warbler	*Dendroica townsendi*
Hermit Warbler	*Dendroica occidentalis*
Swainson's Warbler	*Limnothylpis swainsonii*
Connecticut Warbler	*Oporornis agilis*
MacGillivray's Warbler	*Oporornis tolmiei*
Western Tanager	*Piranga ludoviciana*
Black-throated Sparrow	*Amphispiza bilineata*
Sage Sparrow	*Amphispiza belli*
Golden-crowned Sparrow	*Zonotrichia atricapilla*
Scott's Oriole	*Icterus parisorum*
Brambling	*Fringilla montifringilla*
Pine Grosbeak	*Pinicola enucleator*
White-winged Crossbill	*Loxia leucoptera*
Common Redpoll	*Carduelis flammea*
Lesser Goldfinch	*Carduelis psaltria*

* = Federally Listed T&E species
SMC = Species of Management Concern (USFWS 1995)