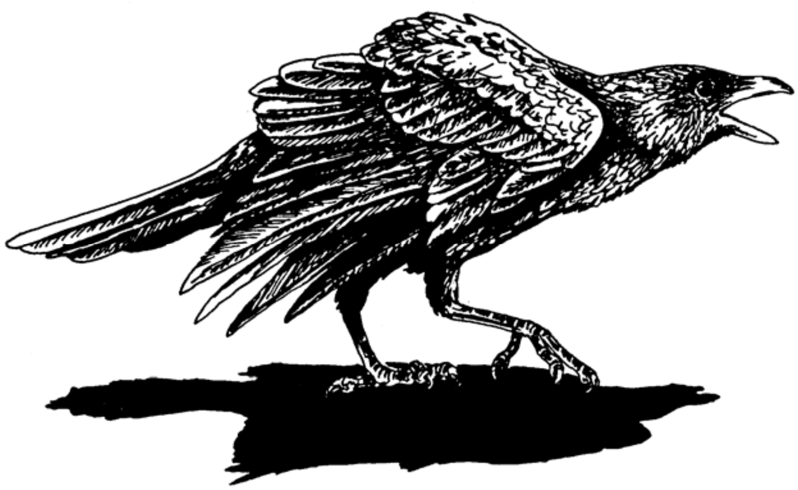
ENVIRONMENTAL ASSESSMENT

of

BIRD DAMAGE MANAGEMENT IN KANSAS



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ACRONYMS USED

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

CHAPTER 1: PURPOSE OF AND NEED FOR ACTION

1.1 INTRODUCTION

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

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

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

This Environmental Assessment (EA) evaluates ways that this responsibility could be carried out to resolve conflicts with bird species in Kansas. Bird damage management (BDM) is an important function of the Kansas WS Program (KWSP). Appendix C lists all bird species that have been found in Kansas with Table C1 listing those species that have the highest probability of coming into conflict with people in Kansas or being part of disease surveillance projects.

KWSP is a cooperatively funded and service oriented program. Before operational BDM is conducted, *Agreements for Control* or *KWSP Work Plans* must be signed by KWSP and the land owner/administrator. KWSP cooperates with private property owners and managers and with appropriate land and wildlife management agencies, as requested, with the goal of effectively and efficiently resolving wildlife damage problems in compliance with all applicable federal, state, and local laws.

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

1.2 PURPOSE

The purpose of this EA is to analyze the effects of KWSP activities in Kansas to manage damage caused by bird species or species groups. KWSP BDM activities are conducted to protect human health and safety at airports and threats of human disease, agricultural resources including livestock and their feed and health, crops, and aquaculture, property such as homes, aircraft, turf, machinery, electrical equipment, and ornamental trees, and natural resources such as threatened and endangered (T&E) species, other wildlife, fisheries, and public recreation areas. Kansas has 320 species of birds that can be found regularly in all or a portion of the State at some time during the year. An additional 119 species have been documented to occur in Kansas, but are outside of the species' normal range (accidentals); some of these species are seen annually and a few may even nest, but not in any abundance or regularity. Of the regular residents, 113 (not including T&E species) could be the focus of a BDM project. Of these, 86 species could be targeted to protect resources other than aircraft and human health and safety at airports. The species that this EA will address are those that are normally found in Kansas and cause problems and are listed in Appendix C: Table C1. The primary species that KWSP receives requests for assistance, mostly in order of BDM assistance given by KWSP, include European Starlings[1], feral domestic pigeons, blackbirds (blackbirds, grackles, and cowbirds), House Sparrows, Canada Geese, Snow Geese, Mallards, Cattle Egrets, American Crows, Turkey Vultures, and woodpeckers. Several other species cause minor, but potentially locally serious, problems mostly at airports. All of these species or their groups will be discussed in Section 2.2.1. However, KWSP does have the potential of being involved with any bird species in Kansas.

Ordinarily, according to APHIS procedures implementing the National Environmental Policy Act (NEPA), individual WDM actions, and research and developmental activities may be categorically excluded (7 Code of Federal Regulation (CFR) 372.5(c), 60 Fed. Reg. 6000-6003, 1995). However, we prepared this EA on BDM in Kansas to facilitate planning and interagency coordination, to streamline program management, and to involve the public and obtain their input through comments and feedback. This predecisional EA documents the need for BDM in Kansas and assesses potential impacts and effects of various alternatives addressing the resolution of bird damage problems. This EA is tiered to the USDA-APHIS-WS programmatic Environmental Impact Statement (EIS) (*hereinafter referred to as* USDA 1997).

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. In FY04(federal fiscal year 2004 = October 1, 2003 – September 30, 2004), birds were responsible for 425 agricultural related requests for assistance, 11 for property, 10 for natural resources, and 6 for human health and safety (452 total requests). This information is kept in the MIS[1]. Requests for assistance are an indication of need, but the requests that KWSP receives likely represent only a portion of the need in actuality. Therefore, KWSP loss reports do not actually reflect the total value of bird damage in Kansas, but provides an indicator of the annual losses. Also, some people are unaware of the KWSP and may try to resolve problems themselves without requesting KWSP assistance.

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[1] Bird species found in Kansas and their scientific names are given in Appendix C.

[2] **MIS** - Computer-based Management Information System used by WS for tracking Program activities. WS in Kansas has had the SQL-based MIS system operational since 1993, but was replaced with MIS 2000 10/01/04. Differences in the systems and current reports have reduced some output such as damage losses in FY05 and FY06. MIS reports will not be referenced in the Literature Cited Section since most reports from the MIS are not kept on file. A database is kept that allows queries to be made to retrieve the information needed.

1.3.1 Summary of Proposed Action

The proposed action is to continue the current portion of the WS program in Kansas that responds to requests for BDM to protect human health and safety, agricultural resources such as livestock feed, livestock, livestock health, aquaculture, and crops, property such as turf, landscaping, and structures, and natural resources such as T&E species, other wildlife, and forestry in Kansas. A major component of KWSP 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 KWSP 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 KWSP 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 KWSP would include shooting, trapping, egg addling/destruction, DRC-1339, Avitrol®, and live capture by trapping or use of the tranquilizer alpha-chloralose (A-C) followed by euthanasia with an appropriate drug such as Fatal Plus®. Nonlethal methods used by KWSP may include wire barriers and deterrents such as porcupine wire, netting, and fencing, the tranquilizer A-C followed by relocation, chemical repellents (e.g., methyl anthranilate, polybutene products), and harassment with auditory devices (e.g., propane cannons, pyrotechnics, distress calls) and visual repellents (e.g., reflective tape, human effigies, balloons). In many situations, the implementation of nonlethal methods such as exclusion-type barriers would be the responsibility of the requestor to implement. BDM by KWSP would be allowed in the State, when requested, on private property sites or public facilities where a need has been documented, upon completion of an Agreement for Control. 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 65 different diseases transmittable to humans or domestic animals have been associated with feral pigeons, starlings, and House Sparrows (Weber 1979). In most cases in which human health concerns are a major reason for requesting BDM, no actual cases of bird transmission of disease to humans have been proven to occur. The risk of disease transmission from birds is often the underlying reason people request assistance from KWSP.

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 such 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, cryptococcosis	causes middle ear infection in swine, dogs, and cats
encephalitis (8 forms)	headache, fever, stiff neck, vomiting, nausea, drowsiness, disorientation	mortality rate for eastern equine encephalomyelitis may be around 60%	may cause mental retardation, convulsions and paralysis
MYCOTIC (FUNGAL)			
aspergillosis	affects lungs and broken skin, toxins poison blood, nerves, and body cells	not usually	causes abortions in cattle
blastomycosis	weight loss, fever, cough, bloody sputum and chest pains.	rarely	affects horses, dogs and cats
candidiasis	infection of skin, fingernails, mouth, respiratory system, intestines, and urogenital tract	rarely	causes mastitis, diarrhea, vaginal discharge and aborted fetuses in cattle
cryptococcosis	lung infection, cough, chest pain, weight loss, fever or dizziness, also causes meningitis	possible especially with meningitis	chronic mastitis in cattle, decreased milk flow and appetite loss
histoplasmosis	pulmonary or respiratory disease. May affect vision	possible, especially in infants and young children or if disease disseminates to the blood and bone marrow	actively grows and multiplies in soil and remains active long after birds have departed
PROTOZOAL			
American 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). KWSP is part of an interagency team conducting, assisting, or supervising in disease surveillance by collecting biological samples to monitor for the presence of various diseases such as highly pathogenic (HP) avian influenza (HP H5N1 AI). Samples are obtained from live and dead birds, and often certain species are targeted. For example with HP H5N1 AI, waterfowl, gulls, and shorebirds were the focus of surveillance in Kansas; 539 AI samples were collected in FY06 from these species in Kansas.

The EA discusses the need to manage wild and feral birds to reduce the risk of disease transmission to humans and livestock. KWSP is receiving increasing requests for assistance with surveillance for disease in wild and feral birds. In 2006, WS was one of several agencies and organizations participating in surveillance for the AI virus in migrating birds in North America.

AI is caused by a virus in the Orthomyxovirus group. Viruses in this group vary in the intensity of illness they may cause (virulence). Wild birds, in particular waterfowl and shorebirds, are considered to be the natural reservoirs for AI (Clark 2003). Most strains of AI rarely cause severe illness or death in birds although the H5 and H7 strains tend to be highly virulent and very contagious (Clark 2003).

Recently, the occurrence of HP H5N1 AI virus has raised concerns regarding the potential impact on wild birds, domestic poultry, and human health should it be introduced into the U.S. It is thought that a change occurred in a low pathogenicity AI virus of wild birds, allowing the virus to infect chickens, followed by further change into the HP H5N1 AI. HP H5N1 AI has been circulating in Asian poultry and fowl resulting in death to these species. HP H5N1 AI likely underwent further changes allowing infection in additional species of birds, mammals, and humans. More recently, the virus moved back into wild birds resulting in significant mortality of some species of waterfowl, gulls, and cormorants. This is only the second time in history that a highly pathogenic form of AI has been recorded in wild birds. Numerous potential routes for introduction of the virus into the United States exist including illegal movement of domestic or wild birds, contaminated products, and the migration of infected wild birds.

The nationwide surveillance effort has detected some instances of low pathogenic AI viruses, as was expected given that waterfowl and shorebirds, are considered to be the natural reservoirs for AI. Tens of thousands of birds have been tested, but there has been no evidence of the HP H5N1 AI virus in North America.

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 1990 – 2005, Kansas aviation officials reported 272 bird strikes (FAA National Wildlife Strike Database). Several significant strikes that occurred in Kansas are:

> In 1998, four geese struck an Aero Commander 500 prompting the pilot to declare an emergency and to return to Billard Airport near Lake Perry after temporarily losing control. Major damage to the aircraft was reported and the plane was out of service for two months for repairs.
>
> During a lift off at Wichita's Mid-Continent Airport in September of 1999, an MD-83, carrying Secretary of Agriculture Dan Glickman, struck a flock of starlings causing the pilot to declare an emergency and return to land.
>
> In March of 2000, a B747 at Forbes Field ingested an unknown bird into one of its engines causing a compressor stall and flameout. The engine and nose cowl were removed and replaced at a cost of $445, 990.

To date, no documented wildlife strikes have resulted in loss of human life in Kansas; however, strikes continue to occur, increasing the risk for a catastrophic event. Such was the case at Elmendorf AFB, AK in September 1995 where 24 human lives were lost as a result of an “AWACS” aircraft crash after ingesting four Canada Geese during takeoff (Cleary and Dolbeer 1999).

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

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

Contribution of Livestock and Dairies to the Economy. Livestock and dairy production in Kansas contributes substantially to local economies. In 2006, the number of cattle on feed was 5.3 million which ranks second nationally and represents 23.8% of all cattle fed in the United States. The inventory value of all cattle and calves in Kansas was reported at $6.09 billion dollars. The state had 111,000 milk cows in 2003 which produced 2.1 billion lbs. of milk. Kansas dairy operators generated $252 million in producer gross income in 2003. In 2005, Kansas producers sold over 3 million market hogs, feeder pigs and seed stock with a gross market value of $403 million. These hogs produced over 450 million pounds of pork. (Kansas Agricultural Statistics Service (KASS) 2005).

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

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

A cost:benefit analysis of starling depredation at CAFOs in Nevada (WS 2006) that received WS BDM services found that the cost of only livestock feed losses prevented (the analysis did not include livestock health related problems) to providing BDM services was 4.6:1. For every dollar spent providing BDM, $4.60 was saved by CAFO operators. The CAFOs in Nevada had similar, but often less starlings than CAFOs in Kansas. Another analysis of blackbird and starling depredation at 10 cattle feeding facilities in

Arizona that used WS BDM services conservatively estimated that the value of feed losses on the 10 facilities would have been about $120,000 without WS BDM services which cost approximately $40,000/yr (WS 1996). A similar analysis has not been performed for Kansas feedlots. However, blackbird and starling numbers that have been observed by KWSP personnel at Kansas feedlots have generally been many times greater than the numbers observed at the Arizona facilities (WS 1996). Therefore, the value of feed losses at Kansas feedlots is probably much greater per facility than calculated in the Arizona analysis.

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

1.3.4 Need for BDM to Protect Agricultural Crops

Migratory and resident geese can cause considerable damage to crops, particularly winter wheat. Wheat is a major crop in Kansas, not only for the production of grain, but also as a winter grazing forage for livestock (KASS 2005). The overall populations of many species of geese in North America have experienced a drastic increase over the last few years (Cleary and Dolbeer 1999). Large goose flocks often congregate on winter wheat fields to feed and take advantage of the large open spaces that the fields offer as a safety strategy. Damage to the wheat crop during feeding by geese can be quite extensive; geese often pluck younger plants from the ground during feeding rather than clipping off the vegetative portion of the plant. During spring 2005, KWSP responded to 3 incidents of goose damage to winter wheat fields where it was reported that geese cause $8,160 in damage. As grain producers become more aware of the KWSP BDM program and as bird populations such as geese continue to escalate, reported damage and requests for assistance will undoubtedly increase.

Several studies have shown that blackbirds and starlings can pose a significant economic threat to agricultural producers (Besser et. al. 1968, Dolbeer et al. 1978, and Feare 1984). Studies have shown that blackbirds have caused damages ranging from $4 to $11 million to sunflower crops in North Dakota, South Dakota, and Minnesota annually. On occasion, blackbirds have destroyed entire fields of sunflowers in a few days. During the fall and winter months, the natural migration patterns of blackbirds concentrate large numbers of blackbirds in Kansas and is cause for concern for among sunflower and grain sorghum producers (Kansas ranked 3rd and 1st in production respectively) (National Sunflower Assoc. 2005). Kansas farmers produced half of the nation's grain sorghum crop and sunflower production is expected to increase in the near future (National Sunflower Assoc. 2005).

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

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).

1.3.5 Need for BDM to Protect Property

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

Feral domestic and wild waterfowl sometimes congregate at golf courses, parks, and other recreational areas that have ponds or watercourses and cause damage by grazing on turf and the accumulation of droppings. 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. Small to large flocks of up to 400 Canada Geese are common at golf courses throughout Kansas.

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

Estimates of damage to aircraft at an airbase in Oklahoma have been made (C. Baker, WS Specialist, OK, pers. comm. 2005) for repairing aircraft skin on a KC-135 damaged from bird droppings (primarily roosting starlings, pigeons, and House Sparrows) and ranged from $10,000-$15,000 in replacement materials with an additional estimated 100 hrs labor at $95/hr. required for a full wing repair for a total cost of over $20,000. Spot repairs can be expected to require $3,000-$4,000 in materials with approximately 50 hrs. of labor at $95/hr.

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

1.3.6 Need for BDM to Protect Aquaculture

Kansas aquaculture had $342,000 in total aquaculture sales in 2005 (National Agricultural Statistics Service 2006). Most aquaculture in the state, though, consists largely of management agencies such as the Kansas Department Wildlife and Parks (KDWP). Occasionally, fish-eating birds such as herons, egrets, Double-crested Cormorants, Herring Gulls, Ring-billed Gulls, 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, KWSP could be requested to assist in resolving such problems. In most cases, KWSP 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, KWSP could also be requested to provide on-site operational assistance involving the use of nonlethal and lethal means of resolving bird damage problems at these or similar facilities. Lethal methods would generally be restricted to taking only a few birds to reinforce the remaining birds' fear of harassment and exclusionary techniques.

1.3.7 Need for BDM to Protect Wildlife Including T&E Species

Some of the species listed as T&E under the Endangered Species Act of 1973 (ESA) are preyed upon or otherwise adversely affected by certain bird species. Direct predation has been shown to seriously limit the recovery of T&E and sensitive bird species, particularly ground nesting birds. Interior Least Terns, Snowy Plovers, and Piping Plovers are examples of T&E species in Kansas that could be subjected to damage from predatory birds. Studies have been conducted in other states to determine population trends of least terns and piping plovers and these studies have shown that predation plays a significant role in nest losses (Kirsch 1993). Birds of prey, as well as mammalian carnivores, kill adult California Least Terns and their young, and destroy nests in nesting colonies of this endangered species. The California WS program traps raptors in a number of these areas at the request of land managing agencies to protect this species and allow for successful reproduction (Butchko and Small 1992). Bird species documented as potential threats to the long term nesting success of terns include Red-tailed Hawks, Great Horned Owls, American Kestrels, Northern Harriers, and Burrowing Owls. Black-crowned Night-Herons are another potential predator of terns and plovers (Kirsch 1993). Interior Least Terns are summer residents of Kansas. Small nesting colonies may be found on salt flats, reservoir beaches, and river sandbars in the larger rivers in the state, and at the Cheyenne Bottoms Wildlife Area as well as the Quivira National Wildlife Refuge near Stafford, Kansas (USFWS 2002).

Inter-specific nest competition has been well documented in starlings. Miller (1975) and Barnes (1991) reported starlings were responsible for a severe depletion of the Eastern Bluebird population due to nest competition. Nest competition by starlings has also been known to adversely impact American Kestrels (Nickell 1967; Von Jarchow 1943; Wilmer 1987), Red-bellied Woodpeckers, Gila Woodpeckers (Centurus uropygialis) (Ingold 1994, Kerpez et al. 1990), and Wood Ducks (Shake 1967, Heusmann et al. 1977, Grabill 1977, McGilvery and Uhler 1971). Weitzel (1988) reported 9 native species of birds in Nevada had been displaced by starling nest competition, and Mason et al. (1972) reported starlings evicting bats from nest holes. Control operations as proposed under the current program could reduce very local starling populations, but it is not likely to reduce them enough unless BDM were focused at the time of nesting. Reduction in nest site competition would be a beneficial impact on the species listed above. Although such reductions are not likely to be significant over large areas, there could be some cases where some individuals limited by environmental factors could benefit by enhanced recruitment during nesting seasons.

Lesser Prairie-Chickens were once common birds in western Kansas. A lack of quality habitats, along with other factors have contributed to over a 90% decline in prairie-chicken numbers over time. The Lesser Prairie-Chicken is currently at a critical period for long-term survival (Hagen 2003) and has been listed as a species "warranted but precluded" for listing under the ESA (Fed. Reg. Notice 63(110):31400-31406). Some research has shown that management of predator species, including predatory birds, in fragmented habitat can enhance prairie-chicken recruitment (Schroeder and Baydack 2001). Primary predators of Lesser Prairie-Chickens are Red-tailed Hawks, Rough-legged Hawks, Ferruginous Hawks, Prairie Falcons, Great Horned Owls, Golden Eagles, and Northern Harriers.

The nests of several endangered birds are frequently parasitized by Brown-headed Cowbirds. An endangered bird that has been negatively affected by Brown-headed Cowbirds is the Black-capped Vireo (Brown 1994, Grzybowski 1995). The cowbirds lay their eggs in active nests of other bird species. Cowbirds are known to lay eggs in the nests of more than 100 different bird species. Each female will lay as many as 40 eggs per year in surrogate nests (Lowther 1993). The cowbird eggs hatch first and the young are cared for by the host bird as if they were its own. By the time the host birds' own eggs hatch, the cowbird young are larger and out-compete the host birds' young for food and frequently push them out of the nest. With endangered bird species, such parasitism can cause enough nest failures to jeopardize the host species. A number of agencies, including WS in Arizona, California, Michigan, and Texas, have historically conducted cowbird trapping and other population control measures in certain areas (e.g., at feedlots and roost locations) to successfully reduce nest parasitism in areas.

Another natural resource protection activity is the protection of T&E fish and fisheries from fish-eating birds, especially where piscivorous birds congregate in large numbers. Several piscivorous bird populations have escalated significantly over the last 40 years and can deplete fisheries in local areas.

KWSP is currently not involved in operational natural resource or T&E species protection activities, but could be called upon to do so in the future.

1.4 RELATIONSHIP OF THIS EA TO OTHER ENVIRONMENTAL DOCUMENTS

WS issued a Final EIS on the national APHIS-WS program (USDA 1997). Pertinent information from USDA (1997) has been incorporated by reference into this EA. KWSP has covered a portion of BDM activities in Kansas under a previous EA, Finding of No Significant Impact, and Decision for starling and blackbird control at feedlots (WS 2001). This EA will supersede that Decision.

1.5 DECISION TO BE MADE

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

- Should BDM as currently implemented by KWSP be continued in the State?
- If not, how should KWSP fulfill its legislative responsibilities for managing bird damage in the State?
- What standard operating procedures (SOPs) should be implemented to lessen identified potential impacts?
- Do KWSP 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 KWSP BDM to protect human health and safety, agricultural resources, property, and natural resources on private or public lands throughout Kansas wherever such management is requested. This includes BDM for the protection of resources and bird management for monitoring and surveillance purposes.

1.6.2 American Indian Lands and Tribes

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

1.6.3 Federal Lands

Kansas has a number of different federal lands within its boundaries and KWSP has been requested to conduct BDM on them (e.g., Fort Riley, Cimarron National Grasslands). The methods employed and potential impacts are the same on these lands as they would be on private lands upon which KWSP provides service. Therefore, if KWSP 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, KWSP 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 KWSP determines that new needs for action or new alternatives having different environmental effects must be analyzed. At that time, this analysis and document will be reviewed and revised as necessary. This EA will be reviewed each year to ensure that it is complete and still appropriate to the scope of the State BDM activities.

1.6.5 Site Specificity

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

Planning for the management of bird damage must be viewed as being conceptually similar to federal or other agency actions whose missions are to stop or prevent adverse consequences from anticipated future events for which the actual sites and locations where they will occur are unknown but could be anywhere in a defined geographic area. Examples of such agencies and programs include fire and police departments, emergency clean-up organizations, insurance companies, and other emergency response agencies. Although some of the sites where bird damage is likely to occur and lead to requests to KWSP 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 (Figure 3) and WS Directive 2.105 is the site-specific routine thought process for determining methods and strategies to use or recommend for individual actions conducted by KWSP (see USDA 1997, Chapter 2 and Appendix N for a more complete description of the WS Decision Model and examples of its application). The Decision Model is not intended to require documentation or a written record each time it is used, and it necessarily oversimplifies complex thought processes (Slate et al. 1992). Decisions made using the model would be in accordance with SOPs described herein and adopted or established as part of the decision.

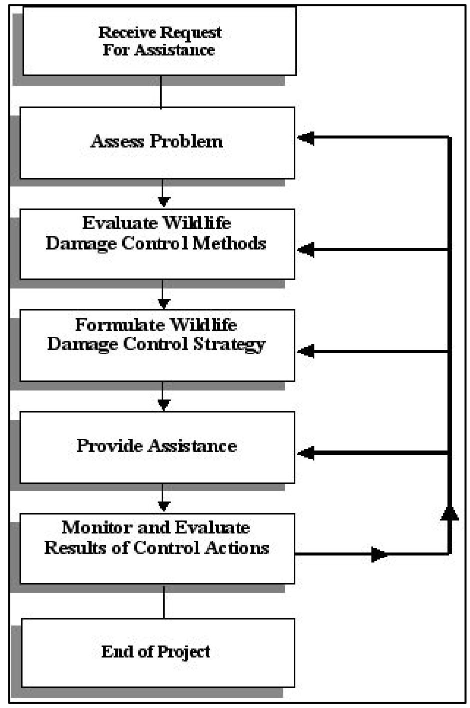

Figure 3. WS Decision Model used at the field level to evaluate a wildlife damage problem (*copied from* Slate et al. 1992).

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

1.7 AUTHORITY AND COMPLIANCE

1.7.1 Authority of Federal and State Agencies for BDM in Kansas

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

The primary statutory authorities for the APHIS-WS program are the Act of March 2, 1931 (46 Stat. 1468; 7 United States Code (USC) 426-426b) as amended, and the Act of December 22, 1987 (101 Stat. 1329-331, 7 USC 426c). The Act of March 2, 1931, as amended in the Fiscal Year 2001 Agriculture Appropriations Bill, provides that:

> "*The Secretary of Agriculture may conduct a program of wildlife services with respect to injurious animal species and take any action the Secretary considers necessary in conducting the program. The Secretary shall administer the program in a manner consistent with all of the wildlife services authorities in effect on the day before the date*

> *of the enactment of the Agriculture, Rural Development, Food and Drug Administration, and Related Agencies Appropriations Act, 2001."*

The Act of December 22, 1987 provides in part:

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

KWSP conducts WDM in cooperation with and under the authorities of KDA and KDWP. KWSP 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 1.6.2. The BDM methods that can be used in Kansas are discussed in Section 3.2.1.2 and in more detail in Appendix E, and each bird damage situations may require the use of one or more of these.

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

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

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

1.7.1.5 U.S. Fish and Wildlife Service. USFWS is responsible for managing and regulating take of migratory bird species listed under the Migratory Bird Treaty Act. They are also responsible for regulating T&E species under ESA. Sections 1.7.2.2 and 1.7.2.3 below describe WS' interactions with the USFWS under these two laws.

1.7.2 Compliance with Federal Laws

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

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

1.7.2.2 Endangered Species Act. It is federal policy, under ESA, that all federal agencies shall seek to conserve T&E species and shall utilize their authorities in furtherance of the purposes of the Act (Sec.2(c)). WS conducts Section 7 consultations with USFWS to use the expertise of the USFWS to ensure that "any action authorized, funded or carried out by such an agency . . . is not likely to jeopardize the continued existence of any endangered or threatened species . . . Each agency shall use the best scientific and commercial data available . . ." (Sec.7(a)(2)). WS obtained a Biological Opinion (BO) from USFWS in 1992 describing potential effects on T&E species and prescribing reasonable and prudent measures for avoiding jeopardy (USDA 1997, Appendix F). WS is in the process of initiating formal consultation at the programmatic level to reevaluate the 1992 BO and to fully evaluate potential effects on T&E species listed or proposed for listing since the 1992 USFWS BO (USDA 1997, Appendix F).

1.7.2.3 Migratory Bird Treaty Act. The Migratory Bird Treaty Act of 1918 (16 USC 703-711; 40 Stat. 755), as amended, provides the USFWS regulatory authority to protect species of birds that migrate outside the United States. The law prohibits any "take" of bird species, eggs and nests and possession of birds or bird parts by private entities, except as permitted by the USFWS; therefore, the USFWS issues permits to private and public entities for reducing bird damage. As a result of Executive Order 13186 of January 10, 2001, the Responsibilities of Federal Agencies to Protect Migratory Birds, (Section 1.7.2.7 below) a draft Memorandum of Understanding (MOU) is being developed by WS at this time with USFWS for the purpose of migratory bird conservation.

KWSP may provide on-site assessments for persons experiencing migratory bird damage to obtain information on which to base damage management recommendations. Damage management recommendations could be in the form of technical assistance or operational assistance. When appropriate, KWSP may provide recommendations to the USFWS for the issuance of depredation permits to private entities to resolve a bird damage problem. The ultimate responsibility for issuing such permits rests with the USFWS (50 CFR 21.41). Starlings, feral domestic pigeons, House Sparrows, and domestic waterfowl are not classified as protected migratory birds and therefore have no protection under this Act. USFWS depredation permits are not required to kill blackbirds, cowbirds, all grackles, crows, or magpies in Kansas found committing or about to commit depredation upon ornamental or shade trees, agricultural crops, livestock, or wildlife, or when concentrated in such numbers and manner as to constitute a health hazard or other nuisance. KWSP can also take Double-crested Cormorants "*…to reduce depredation of aquaculture stock at freshwater commercial aquaculture facilities and State/Federal fish hatcheries*." 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 KWSP are registered with and regulated by the EPA and KDA, and are used by KWSP 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 KWSP 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 KWSP BDM and sign agreements for KWSP to conduct BDM on their lands; thus, tribes have control over any potential conflict with cultural resources on tribal properties. KWSP activities as described under the proposed action do not cause ground disturbances nor do they otherwise have the potential to significantly affect visual, audible, or atmospheric elements of historic properties and are thus not undertakings as defined by NHPA. BDM could benefit historic properties if birds were damaging such properties. In those cases, the officials responsible for management of such properties would make the request and would have decision-making authority over the methods to be used. Harassment techniques that involve noise-making could conceivably disturb users of historic properties if they were used at or in close proximity to such properties; however, it would be an exceedingly rare event for noise-producing devices to be used in close proximity to such a property unless the resource being protected from bird damage was the property itself, in which case the primary effect would be beneficial. Also, the use of such devices is generally short term and could be discontinued if any conflicts with historic properties arose. WS has determined BDM actions are not undertakings as defined by the NHPA because such actions do not have the potential to result in changes in the character or use of historic properties. A copy of this EA is being provided to each American Indian Tribe in Kansas to allow them opportunity to express any concerns that might need to be addressed prior to a decision.

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

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

1.7.2.8 Executive Order 13186 - Responsibilities of Federal Agencies to Protect Migratory Birds. Executive Order 13186 of January 10, 2001 directs federal agencies taking actions that have, or are likely to have, a measurable negative effect on migratory bird populations to develop and implement, within 2 years, an MOU with USFWS that shall promote the conservation of migratory birds. WS currently has been working with USFWS on the MOU to cover such activities.

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

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

CHAPTER 2: DISCUSSION OF ISSUES

Chapter 2 contains a discussion of the issues, including issues that will receive detailed environmental impacts analysis in Chapter 4 (Environmental Consequences), issues that have driven the development of SOPs, 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 SOPs 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 KWSP's involvement in BDM in Kansas is that if, for whatever reason, the BDM conducted by KWSP were discontinued, similar types and levels of BDM will most likely be continued by State or local governments or private entities as allowed by State and Federal laws. Thus, many of the BDM activities could take place without Federal assistance, and, hence, would not trigger NEPA. From a practical perspective, this means that the Federal WS program has limited ability to affect the environmental outcome of BDM in Kansas, except that, based on KWSP employees' years of professional expertise and experience in dealing with BDM actions, KWSP 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, KWSP 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, KWSP 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 KWSP BDM assistance. Thus, KWSP has a limited ability to affect the environmental status quo in Kansas. Despite this limitation of Federal decision-making in this situation, this EA process is valuable for informing the public and decision-makers of relevant environmental issues and analyzes these under the potential alternatives of BDM to address the various needs for action described in the EA.

2.1 ISSUES

The following issues or concerns about BDM have been identified through interagency planning and coordination, from the EA which preceded this document (WS 2001), WS EAs in other states, and USDA (1997) as areas of concern that will be addressed in this EA.

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

2.1.1 Effects of BDM on Target Bird Species Populations

A common concern among members of the public, wildlife management agencies, and WS is whether BDM actions adversely affect the viability of target native species populations. The target species selected for analysis in this EA are the primary ones which may be affected by KWSP'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, Brown-headed Cowbirds, Common Grackles). Other species that have been killed in limited numbers include herons, egrets, vultures, hawks, 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 KWSP which, for purposes of this EA are primarily European Starlings, House Sparrows, feral domestic pigeons, blackbirds (primarily Red-winged Blackbirds and Brown-headed Cowbirds), Canada Geese, Mallards, and Cattle Egrets. Scoping during USDA (1997) revealed that some persons believe WDM interrupts the "balance of nature" and this should be avoided. Others believe that the "balance" has shifted to unfairly favor generalist species, including birds. Several species' populations have steadily increased over the past several years due to adaptability to human-made environments, and damage from these species has increased accordingly (International Association of Fish and Wildlife Agencies 2004). To address these concerns, the effects of the alternatives on populations for each target species are examined. To fully understand the need for BDM, it is important to have knowledge about the species that cause damage and the likelihood of damage. Full accounts of life histories for these species can be found in bird reference books. Some background information is given here for the bird species in Kansas covered by this EA, especially information pertaining to their range and seasonal movements in Kansas. The species are basically given in order of KWSP BDM efforts directed towards them, their subsequent take, and the occurrence and value of damage that the species cause in Kansas Some of the lesser damaging species are lumped with others where life history and damage are somewhat similar. Finally, it should be noted that jurisdiction and management of these species mostly lies with USFWS and KDWP which was discussed in Section 1.7.1.2 and 1.7.1.5. Additionally, some of the birds addressed in this EA are harvested in Kansas by hunters. Where data is available, harvest is used with KWSP take to determine cumulative impacts.

2.1.1.1 Basic Bird Species Information.

Starlings and Blackbirds. European Starlings and blackbirds are common residents and migrants in Kansas. Seven species of blackbirds are found in Kansas; Red-winged, Yellow-headed, Brewer's, and Rusty Blackbirds, Common and Great-tailed Grackles, and Brown-headed Cowbirds and all are abundant seasonally, except the Rusty Blackbird. Blackbirds are medium sized songbirds with heavy bills. They have iridescent black feathers and medium length tails. Starlings are similar in size, but appear stockier with a shorter tail and are heavily speckled in winter; they were introduced into North America from Europe. Starlings are cavity nesters and will use any structures with holes for nesting. All are gregarious, especially in winter when they form roosts in the thousands of mixed species. Large flocks begin to form roosts as early as August and disband in April. Starlings require a higher protein diet consisting of mainly fruits, insects, and some grains. Blackbirds are primarily granivorous. Blackbirds are attracted to a variety of habitats depending on the species. Brewer's Blackbirds and starlings are attracted to urban areas such as the airport, grass and weedy fields, and fallow croplands and livestock feeding operations. Brown-headed Cowbirds are found in similar environments and open woodlands. These species form roosts in winter where cover and warmth is provided. Red-winged and Yellow-headed Blackbirds and Common Grackles are attracted to croplands and weedy fields, and roost and nest in marshy areas, especially cattails. Rusty Blackbirds are common in wet woodlands. The species roosts with other blackbird species, but often is found foraging in single species flocks or together with common grackles in or near wooded wetlands. Only occasionally are rusty blackbirds observed foraging in agricultural fields with other blackbirds. The majority of blackbirds leave Kansas during winter, but the European Starling can be found in Kansas year round. The Yellow-headed Blackbird only breeds in Kansas, typically migrating south for the winter. The Rusty and Brewer's Blackbirds nest further north but migrate through Kansas with some wintering. The European Starling, Red-winged Blackbird, Common Grackle, and Brown-headed Cowbird are the most abundant species in Kansas, far surpassing the other species. Blackbirds are classified as migratory nongame birds, but can be taken under a USFWS Depredation Order when concentrated in a manner that constitutes a health hazard. The starling is unprotected by State and Federal laws and can be taken at any time. Blackbirds and starlings can cause significant damage to agricultural crops and livestock operations. Blackbirds and starlings are considered a great threat to aviation because of the large flocks they form. In addition, winter roosts are a noise nuisance and their droppings damage buildings and property; if droppings are allowed to build up, they can become a source of several infectious diseases. Nesting by starlings can create a number of problems, including nuisance and fire hazards to buildings. Brewer's Blackbirds, in particular, are very aggressive nesters and will often attack people nearing the nest. Finally, the Brown-headed Cowbird is a parasitic nester, lay eggs in other bird nests. This has been linked to add to the decline of several song birds such as the Black-capped Vireo, a historic nester in Kansas.

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

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

Raptors. Raptors include vultures, eagles, hawks (osprey, kites, harriers, accipiters, buteos, and falcons), and owls. Shrikes are also included in this category because of behavioral similarities. Kansas has one species of vulture, 2 eagles, 14 hawks, 6 owls, and 2 shrikes that have the potential to be involved in BDM projects. Raptors are predatory birds and scavengers that possess hooked beaks and talons to capture and feed on prey. Shrikes do not have talons, instead they impale their prey on thorns or barbed-wire to feed on them. Raptors range in size from small such as the Burrowing Owl and American Kestrel to large such as Golden Eagles. Most species have typical hunting styles; soaring (vultures, eagles, red-tailed hawks), low-flying (harriers) and dense forest (accipiters) ambush, hovering (kestrel), and watching from perches (buteos, owls). Most are solitary hunters. Most owls are nocturnal and hunt at night. The combination of abundant small mammal populations, open spaces, and roosting and perching structures provides ideal habitat for most raptors. Most raptors do not cause significant problems. Eagles, Red-tailed Hawks, Great Horned Owls, 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 sometimes chase prey bird species into warehouses where they must be trapped to be released back outside. Mississippi Kites are very aggressive nest defenders and will occasionally strike people that near their nest, often drawing blood from the victim of their attack. However, this problem infrequently occurs in Kansas. Raptors, though, represent a significant hazard to aircraft due to their larger sizes and hunting over open spaces such as airfields. Raptors are protected as migratory birds. Eagles are specifically protected under their own Act and an additional permit is required to harass or take them. Wildlife control personnel avoid harassing eagles, but would if it became necessary at an airport where they were a potential threat to aircraft. The Bald Eagle, Northern Harrier, Ferruginous Hawk, Peregrine Falcon, Common Barn Owl, Burrowing Owl, Short-eared Owl, and Loggerhead Shrike are species of special concern (USFWS 1995) and considered accordingly.

Waterfowl. Waterfowl primarily refers to ducks, geese, and swans, but also cranes, moorhens, and coots because these species have mostly been managed as migratory game birds and are similar in size and behavior. Ducks can be further subdivided into surface feeders and divers. Ten species of surface feeding ducks, 11 species of diving ducks, 5 geese, a swan, 2 cranes, a moorhen, and a coot can be found in Kansas. Most are common seasonally, some only migrating through Kansas. Of all of the species, Canada Geese and Mallards are abundant year round and cause the most damage concerns. Waterfowl are aquatic birds with webbed feet, long necks, narrow pointed wings, and short legs. Cranes are tall birds with long legs, beak, and neck, and non-webbed feet. Coots and moorhens 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 is a federally listed endangered species and is avoided. Control of this species, including hazing activities, would require additional permits (this species would only be a problem if it temporarily stopped in an air operating area of an airport where hazing would not only protect aircraft, but the endangered crane too).

Wading Birds. Waders include herons, egrets, ibis and bitterns or 12 species in Kansas. The largest, the Great Blue Heron, is very common along with the Cattle Egret and Black-crowned Night-Heron. The others are present, but not as common. Most wading birds are medium-sized and have long legs, beaks, and necks for stalking and hunting foods in shallow waters and open fields. Many are adorned with plumes in the breeding season. Wetlands and open areas with abundant prey such as rodents, amphibians, insects, and crayfish are attractive to most wading birds. Many of the species communally nest and these can become an odor and noise nuisance in residential areas. Additionally, where these nesting areas are used year after year, the trees often die from fecal contamination. Wading birds can be a significant problem to aircraft because of their size and slower flight speeds; the feeding behavior of great blue herons and great egrets in open grasslands and the flocking behavior of particularly the cattle egret present additional hazards to aircraft. Wading birds are protected as migratory non-game birds. The White-faced Ibis and American Bittern are species of special concern in Kansas (USFWS 1995).

Shorebirds. Kansas hosts 37 species of shorebirds including avocets, stilts, plovers, sandpipers and phalaropes. Most only migrate through Kansas, but the Killdeer and Upland Sandpiper are abundant during the nesting season. Avocets and stilts are sleek and graceful waders with long slender beaks, and spindly legs. Plovers are compact birds with short beaks; they dart across mudflats, will stop abruptly, and race off again. Sandpipers vary much more, but typically have medium to long legs and beaks, and flocks fly seemingly erratic, but in unison. Phalaropes are similar to plovers with semi-webbed feet and they spin like tops in the water when they are feeding; phalaropes are somewhat unique in that the female is the more colorful and larger. Most shorebirds are attracted to open, shallow water and mudflats. A few can be seen around agricultural fields, especially fallow or short grass fields, after rains. They feed on invertebrates, typically probing mudflats with their beaks. Shorebirds are commonly hit by aircraft where they are abundant. A few shorebirds are medium in size and most flock presenting their biggest threat to aviation. Aviation safety is again the primary concern with these species. Shorebirds are protected as migratory non-game birds. The Eskimo Curlew is listed as endangered, but is likely extinct. The Piping Plover, listed as threatened, migrates through Kansas. Additionally, USFWS (1995) lists three other species as species of management concern, the Mountain Plover, Upland Sandpiper, and Long-billed Curlew.

Other Fish-eating Birds. Five species of terns, the American White Pelican, Double-crested Cormorant, and Belted Kingfisher are found in Kansas, but most only migrate through the State with breeding in isolated areas. The majority winter further south. Terns are typically similar to gulls, except that they are smaller and slimmer with long narrow wings, forked tails, and pointed beaks. Pelicans are large, white water birds with a massive bill and throat pouch, and black wing tips. Cormorants are large, black birds with set back legs, a hooked bill, and reddish-orange facial skin and throat pouch. All form small flocks. Kingfishers are smaller stocky birds with a slate blue back and breast band. Terns, pelicans, and kingfishers dive from the air and cormorants from the water's surface to catch fish. Pelicans and terns primarily roost and nest on the ground, cormorants in trees submerged in water, and kingfishers in banks. These species are attracted to open waters with a good fishery. Kingfishers are usually associated with wooded streams and lakes where they hunt fish and aquatic invertebrates from trees, wires, or other perches. All of these species can cause damage at aquaculture facilities and to native fish stocks. Pelicans and cormorants both represent significant hazards to aircraft because of their size and flocking behavior. They also fly at higher altitudes while traveling to and from feeding areas. Terns are only a problem at airports where good fishing waters are present. Kingfishers are usually not much of a problem because of habitat preference. These species are migratory non-game birds. The Least Tern’s interior population is listed as endangered. The Black Tern is a species of management concern (USFWS 1995).

Corvids. Corvids are jays, magpies, crows, and ravens, and are represented by 6 species in Kansas, but only the Blue Jay, Black-billed Magpie, and American Crow are somewhat abundant. Corvids are well-known, boisterous birds. Crows and ravens are medium sized black birds that are slightly iridescent in sunlight. Magpies are black and white birds that appear medium-sized because of their relatively long tail. Jays have blue in varying amounts contrasted with gray, black and white. Crows, magpies and blue jays are common in open areas close to dense or scattered trees, brushy or riparian habitats. Corvids are opportunistic feeders and will feed on a wide variety of food including fruits, nuts, small animals, insects, refuse, and carrion. Activities such as plowing are very attractive to magpies and crows because of the food that becomes exposed. Crows and magpies are flocking during the winter and can cause problems. The winter roosts of magpies and crows can be a noise nuisance and potential health hazard from accumulated fecal material. All of these species, but especially flocking birds, can cause damage to crops such as pecans and corn. Ravens and magpies will kill livestock, primarily those that are somewhat incapacitated such as newborns or cows calving. Crows and ravens are medium size and can inflict severe damage to airplanes, especially where they are hunting insects in the airfield. Crows are commonly struck by aircraft. Corvids are migratory birds; the crow is a game bird and the others are nongame. Crows and magpies can be taken without a permit when found doing damage.

Woodpeckers. Eight species of woodpeckers are found in Kansas and all but the Ladder-backed Woodpecker are fairly common. Woodpeckers are familiar birds because of their drumming and cavity building behavior. They are relatively small birds with short legs, two forward - two back, sharp clawed toes for climbing trees, stiff tail feathers for support, and a sharp, stout beak for drilling. These characteristics enable them to climb trees while probing for insects or making cavities. Woodpeckers are found near or in wooded areas. Their flight is undulating, a very characteristic trait. They are territorial and usually found alone or in pairs. Woodpeckers are primarily attracted to areas with trees, space, water, and a good food supply. Woodpeckers are primarily insectivorous, though they also eat fruits and nuts (sap for sapsuckers). Woodpeckers can damage structures such as buildings and telephone poles. They can also damage crops such as pecans. Since woodpeckers are fairly territorial, damage is typically at low levels and uniform throughout orchards rather than focused in a particular area. Woodpeckers are protected as migratory non-game birds. The Red-headed Woodpecker is a species of management concern (USFWS 1995).

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

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

Gallinaceous Birds. The Ring-necked Pheasant, Greater and Lesser Prairie-Chickens, Wild Turkey, and Northern Bobwhite are found in Kansas and are collectively known as gallinaceous birds. Gallinaceous birds are basically ground-dwellers with short, rounded wings and short strong bills. Flight is usually very brief for these species as they prefer to walk. Males are typically very colorful and perform elaborate courting displays. Pheasants and quail can be found in several habitats ranging from riparian woodlands to agricultural fields, but primarily open areas with brushy cover. Quail are normally found close to permanent water. Turkeys are found in close association with wooded regions. The prairie-chickens are found in short- and long-grass prairies with interspersed agricultural areas. All are primarily grain and seed eaters. Of these, the turkey and pheasant are usually the only two that cause problems, primarily to agricultural crops. However, their damage is often tolerated because they are highly sought after game birds. Additionally, these species can be hazardous to aircraft when found on or around airports. Gallinaceous birds are protected as resident game birds by KDWP and have hunting seasons. These birds are non-migratory and not protected by federal laws.

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

Frugivorous Birds. Several of the fruit and seed eating birds are found in Kansas and can cause damage. The most notable of these in Kansas, other than those discussed above, are the American Robin, Cedar Waxwing, and House Finch. These birds are all mid-sized small birds, often forming large flocks. The robin is well-known with its red-breast and slate black back. Waxwings are brownish and have crests, black masks, short tails with yellow tips; they get their name from wax-like red tips on the wing feathers of adults. House Finches are small brownish sparrow-sized birds; males have a bright red forehead, breast, and rump. These species are attracted to trees that have fruits or nuts, grains, and areas with an abundance of insects. Earthworms are a major attractant for robins. Most prefer brushy to open areas with scattered trees, and also dense forests. Robins use dense trees or thickets for roosting. Grapes and other fruits can be significantly damaged by these species. Other than agricultural damage, robins and finches can form nightly roosts in residential areas causing some nuisance problems. Additionally, House Finches build large bulky nests, similar to House Sparrows, often in structures that can be a fire hazard. These species are migratory nongame birds and can be taken with a federal permit.

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

Other Birds. A few other birds in Kansas cause damage, though only infrequently. The Northern Mockingbird 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 often see their reflection in windows and incessantly attack the window, becoming a nuisance or sometimes damaging screens. Finally, Greater Roadrunners are fairly common in the southern counties of Kansas. The Greater Roadrunner will take eggs, nestlings, and other wildlife and could be implicated in very local problems. Several other birds are commonly found in Kansas (Table 2 in Appendix C), but few cause, or are expected to cause, damage.

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

Current bird population estimates are unavailable for most species of birds and thus have to be estimated from the best available information. The best information currently available for monitoring most bird population trends is data from the Breeding Bird Survey (BBS). The BBS is a long-term (1966-2005), 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. 2006). BBS routes are surveyed each May and June by experienced birders. The stated primary objective of the BBS has been to generate an estimate of population change for songbirds. Estimates of population trends from BBS data are derived primarily from route-regression analysis (Geissler and Sauer 1990) and are dependent upon a variety of assumptions (Link and Sauer 1998). The statistical significance of a trend for a given species is reflected in the calculated P-value (i.e., the probability of obtaining the observed data or more extreme data given that a hypothesis of no change is true) for a particular geographic area and is best calculated over a number of years. BBS trends are available for 1966 to 2005 and 1980 to 2005, or can be analyzed for any set of years desired. BBS data can be summarized for Kansas, the Central Flyway (the northern limit of the BBS is in central Alberta and Saskatchewan), or survey-wide for species breeding in the BBS survey area.

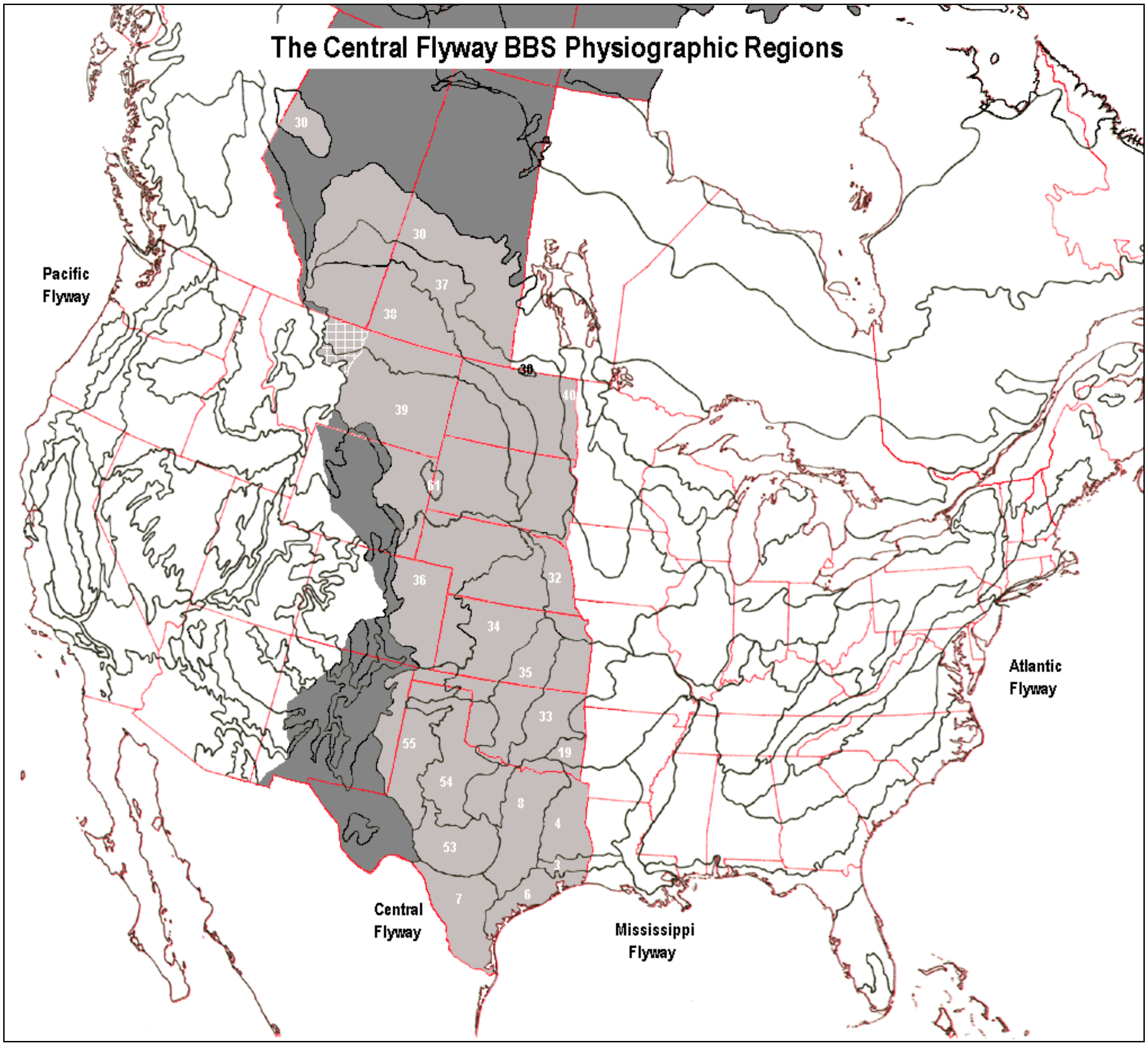

Figure 4. BBS physiographic regions with the Central Flyway (shaded) BBS physiographic regions (shaded light gray) used to estimate migratory bird populations for this EA, including those portions of 38 and 39 in Montana (thatched white) in the Pacific Flyway, but excluding deserts, mountainous, and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

The BBS data are intended for use in monitoring bird population trends, but it is also possible to use BBS data to develop a general estimate of the size of bird populations from the relative abundance. For geographic areas, BBS data (Sauer et al. 2006) can estimate relative abundance of different bird species over a particular time-frame (i.e., 1966-2005, 2001-2005, or 2005). 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 5 years for the geographic area of the majority of bird population involved in BDM (2001 to 2005). For example, starlings, feral pigeons, House Sparrow, and Canada Goose populations are estimated at the statewide level since the majority of BDM projects in Kansas involve resident birds. For most other species, except the Rusty Blackbird, the Central Flyway population is estimated and used for analysis.

Using methods adopted by Partners in Flight to estimate population size with BBS data (Rich et al. 2004), the relative abundance of a bird population can be used to extrapolate a population estimate. The Partners in Flight system involves extrapolating the number of birds in the 50 quarter-mile circles (total area/route = 10 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.

KWSP will use BBS data, averaging the relative abundance for geographic areas from 2001 to 2005 to estimate populations that are impacted lethally by KWSP BDM (Table 1). KWSP conducts BDM for most all species that are either residents in Kansas or primarily come from the Central Flyway which, for the purposes of this EA, will include the central BBS physiographic regions: 3, 4, 6-8, 19, 30, 32-40, 53-55, and 61 in the states and Canadian provinces of southern Alberta, eastern Colorado, Kansas, eastern Montana, Nebraska, far eastern New Mexico, North Dakota, Oklahoma, southern Saskatchewan, South Dakota, Texas, and eastern Wyoming (Figure 4). Additionally, some birds come from areas further north (primarily area 29) in Canada from the Central Flyway or, to a lesser extent, the Pacific, Mississippi, and Atlantic Flyways. The most appropriate population will be estimated for those species that KWSP lethally controls in Kansas from most of the Central Flyway BBS Physiographic Regions. The physiographic regions provide the best estimates of populations because of the similarity of habitat within each region.

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

Many of the requests for assistance that KWSP receives occur during winter when migratory birds have come into Kansas, thus changing bird population numbers. This larger area is used to determine impacts on the population. The National Audubon Society (NAS) conducts nationwide bird surveys within a few weeks of December 25th, the NAS Christmas Bird Counts (CBC). The CBC reflects the number of birds in Kansas during early winter that would occur after migrations are completed. The Christmas Counts are a volunteer effort conducted by all levels of birders and only provides the number seen in a 15 mile diameter circle (177 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.

Table 1. Population estimates for those species that KWSP takes the most in BDM in Kansas.

Species	Detectability Parameters			BBS Survey-wide Pop. Estimate^	Average Count 2001-2005 for BBS Kansas (82,282 mi^2)	Pop. Estimate Using Kansas Ave. Count	Pop. Estimate Using Fig. 2 Central Flyway BBS Physiographic Regions^^
	Dist.	Pair	Time				
Index for Kansas– Less Migratory/"Resident" Species							
European Starling	4	2	1.19	122,000,000	33.11	2,600,000	-
Feral Pigeon	4	2	1.59	26,000,000	2.91	305,000	-
House Sparrow	4	2	1.06	82,000,000	43.36	3,000,000	-
Canada Goose*	2	2	1.00	-	1.85	61,000	-
Population Estimate for Central Flyway BBS Region (Appendix A) – Migratory Species							
Red-winged Blackbird	4	2	1.13	190,000,000	139.10	10,350,000	52,000,000
Brown-headed Cowbird	4	2	1.18	51,000,000	42.51	3,300,000	20,000,000
Common Grackle	4	2	1.39	97,000,000	48.34	4,420,000	19,900,000
Brewer's Blackbird	4	2	1.23	35,000,000	**	**	6,100,000
Great-tailed Grackle	4	2	1.32	8,000,000	2.10#	182,000	13,000,000
Yellow-headed Blackbird	4	2	1.45	23,000,000	**	**	8,800,000
Mallard*	2	2	1.25	-	2.00	66,000	3,800,000
Cattle Egret*	2	2	1.25	-	1.74	57,000	3,000,000
Ring-billed Gull*	2	2	1.25	-	**	**	1,900,000
Mourning Dove	4	2	1.31	114,000,000	130.45	11,250,000	43,000,000
Closed Boreal Forest Physiographic Region Index (BBS Area 29 – 580,000 mi^2) – Migratory Species							
Rusty Blackbird	4	2	1.44	2,000,000	**	**	67,000

* Detectability parameters were estimated for these species
** Does not breed in Kansas
# Relative abundance from trend graph average for 2001-2005 because not available in database.
^ Estimate from BBS for 1990s (Rich et al. 2004)
^^ See appendix A for detailed population estimates for the Central Flyway BBS physiographic regions (2001-2005).

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

A common concern among members of the public and wildlife professionals, including WS personnel, is the potential impacts of damage control methods and activities on nontarget species, particularly T&E species. KWSP's SOPs include measures intended to reduce the effects of BDM activities on nontarget species populations and are presented in Chapter 3. For the last 10 FYs (FY97-FY06), KWSP has not taken any known nontarget species as a result of BDM activities. The potential exists, but this illustrates the low probability.

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

2.1.2.1 Federally Listed T&E Species. Special efforts are made to avoid jeopardizing T&E species through biological evaluations of the potential effects and the establishment of special restrictions or mitigation measures. WS received a Programmatic BO in 1992 (USDA 1997, Appendix F) on the potential for WDM, in general and including most BDM methods currently used, to impact the species listed nationwide, including those in Kansas. USFWS, consulted under Section 7 of the ESA, issued BOs on the species that WS had the likelihood to adversely affect. WS abides by the reasonable and prudent measures and alternatives, and terms and conditions established in the BOs which reduce the potential for take (USDA 1997, Appendix F). These will be discussed in the following individual accounts for listed species that could be affected by BDM. The National WS Program began a new nationwide consultation to replace the 1992 BO (USDA 1997) which will guide BDM activities nationally and supersede the 1992 BO (USDA 1997) when it is complete.

In all, the Federal T&E, and candidate species list for Kansas (Table 2) includes 3 mammals, 7 birds, 4 fish, 1 invertebrate, and 3 plants. KWSP BDM will have no effect on listed mammals, fish, invertebrates, and plants and little potential to adversely affect birds. The only concerns USFWS had regarding T&E birds and BDM was Whooping Crane potential exposure to avian toxicants. On the other hand, KWSP could beneficially affect 5 bird species and 2 of these were specifically discussed in the 1992 USFWS BO. The Black-capped Vireo, though it is no longer found in Kansas, could benefit from Brown-headed Cowbird control where their nests were significantly parasitized by the cowbirds, and the Piping Plover would benefit from gull control in nesting areas. Additionally, the Interior Least Tern would benefit from the control of predatory birds where they were impacting a nesting colony. Finally, the crane, eagle, tern, and plover would also benefit from being hazed away from the air operating area of an airport where they could potentially be struck by aircraft. However, this activity would require a Section 10 permit be issued by USFWS because it would be considered take under ESA, even though the birds were only hazed. Thus, only one species could potentially be adversely impacted by BDM, the Whooping Crane.

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

Species	Scientific Name	Status	Locale	BDM
Mammal				
Gray Bat	*Myotis grisescens*	E	Southeast	0
Indiana Bat	*Myotis sodalist*	E	East	0
Gray Wolf	*Canis lupus*	E	*	0
Bird				
Gunnison Sage-Grouse	*Centrocercus minimus*	C	*	0
Whooping Crane	*Grus americana*	E	Statewide	-, 0, +
Piping Plover	*Charadrius melodus*	T	Statewide	+
Eskimo Curlew	*Numenius borealis*	E	*	0
Least Tern (interior pop.)	*Sterna antillarum*	E	Statewide	+
Black-capped Vireo	*Vireo atricapilla*	E	*	+
Fish				
Pallid Sturgeon	*Scaphirhynchus albus*	E	Northeast	0
Arkansas River Shiner	*Notropis girardi*	T	South	0
Topeka Shiner	*Notropis tristis*	E	Statewide	0
Neosho Madtom	*Noturus placidus*	T	Southeast	0
Arkansas Darter	*Etheostoma cragini*	C	South	0
Invertebrate				
American Burying Beetle	*Nicrophorus americanus*	E	Southeast	0
Plants				
Mead's Milkweed	*Asclepias meadii*	T	East	0
Western Prairie Fringed Orchid	*Platanthera praeclara*	T	Northeast	0
Running Buffalo Clover	*Trifolium stoloniferum*	E	East-central	0

Whooping Crane. This species breeds in northern Canada and migrates through Kansas on their way to their wintering grounds in Texas. In Kansas, they are found during migration in October-November and March-April, primarily in the central area of the State. They associate with large open wetlands, croplands, and pastures, and have designated habitat in the central part of the State. The only BDM methods that were considered to have a potential negative impact on the whooping crane in the USFWS 1992 BO (USDA 1997, Appendix F) would be the use of avicides on grain baits in areas where the cranes were found and could have access to them. However, KWSP does not use avicides, DRC-1339 and Avitrol®, in areas where the crane would be found or have access to them. Thus, USFWS did not believe that WS would have an impact on this species, and as a result, did not issue an Incidental Take Statement for them.

2.1.2.2 State Listed T&E Species. KWPD (2005) lists animals that are considered T&E in Kansas. This list contains most all federally listed species. It also lists a few additional species. KWSP will have no effect on Kansas listed mammals (3), reptiles (7), amphibians (10), fish (16), and invertebrates (15).

KWPD lists 8 species of birds as T&E, and all but 3 were also federally listed and discussed above. The 3 additional species include the Bald Eagle, Peregrine Falcon, and Snowy Plover. KWSP did not conduct BDM for the eagle or falcon from FY97 to FY06. KWSP did haze a Snowy Plover from an air operating area in FY06 at an airport. As discussed above, this would be beneficial since these species could be killed by aircraft. KWSP would discuss needed hazing efforts with KDWP and obtain appropriate permits as necessary, if these species were found in an air operating area of an airport where KWSP was conducting operational BDM. Neither species would be expected to be impacted incidentally in BDM. However, the falcon as well as the plover (as has been shown) could be the target of hazing at an airport where they were in the air operating area. Additionally, as with the Piping Plover, control of predatory birds such as gulls that have been found to be significantly impacting nesting success at a breeding colony could also benefit the Snowy Plover.

Bald Eagle. The Bald Eagle was only recently delisted as a threatened species from the federal list of T&E species. Bald Eagles are generalized predators and scavengers primarily adapted to edges of aquatic habitats. They feed primarily on fish (taken both alive and as carrion), waterfowl, mammalian carrion, and small birds and mammals. The Bald Eagle is a wide-ranging raptor found in all lower 48 contiguous states during some point in its life cycle. It is a bird of aquatic ecosystems, frequenting estuaries, large lakes, rivers, reservoirs and some seacoast habitat. Bald Eagles currently nest in 47 of 48 contiguous states including Kansas, and their numbers continue to increase from a low of about 500 nesting pairs in the mid-1960's to over 6,000 pairs today. They are a common winter resident in Kansas on lakes and rivers throughout the State. BDM has very minimal potential to negatively impact Bald Eagles and none have been taken by KWSP. 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. Nationally, WS has not trapped any eagles with these traps and does not anticipate this occurrence in Kansas.

2.1.2.3 Sensitive Species. USFWS (1995) has a list of species of management concern (SMC) and KDPW (2005) a list of species in need of conservation (SNC) (Appendix C, Table 1 denotes these for bird species). These are sensitive species that typically have declined over the past mostly as a result of habitat loss, but not seriously enough to be considered T&E. USFWS lists 37 non-T&E bird species that are found in Kansas as species of management concern and about half of these, 18, could be the focus of a BDM project, but only 6 off airports (12 at airports only). KDPW (2005) lists 6 mammals, 7 reptiles, 2 amphibians, 23 fish, and 17 invertebrates as SNC which KWSP BDM would not impact and 15 bird species, 7 that were not included on USFWS' (1995b) list. Of the 7 additional species, 4 could be the focus of BDM, one only at airports; 3 species would not likely ever be the focus of a BDM project. Of the sensitive species, KWSP has conducted BDM at airports and taken 4 SMC species from FY02 to FY06, the White-faced Ibis, Northern Harrier, Upland Sandpiper, and Eastern Meadowlark. Most were hazed from the air operating area of airports. Three of these SMC species were killed in BDM because birds did not respond to hazing, the harrier, sandpiper, and meadowlark. These are the only sensitive species that KWSP has targeted for lethal removal from FY97 to FY06. Take of these species will be analyzed in Section 4.1.2.1.

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

KWSP uses a variety of methods when conducting BDM. KWSP Specialists have SOPs to reduce potential safety impacts from BDM to the public and the environment. KWSP relies on its Specialists 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. KWSP 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 KWSP 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 KWSP could use are DRC-1339, an avicide used to remove damaging feral pigeons, starlings, crows or blackbirds, and Avitrol® for House Sparrows and feral pigeons. Chemical repellents that could be used under the proposed action include methyl-anthranilate (MA), an artificial grape flavoring used in the food industry that repels many bird species, methiocarb (Mesurol®) used in eggs to repel corvids from raiding nests of other birds, and polybutene products which are bird repellents that have a tactile, sticky consistency to touch and are applied directly to problem locations to prevent birds such as feral pigeons from perching. Avicides and chemical repellents are regulated under FIFRA by EPA, the Kansas Pesticide Law, and by WS Directives. KWSP applicators are certified by the state, and must complete a written examination and undergo recurrent training. Other chemical methods that could be used are the tranquilizer A-C, used to capture waterfowl and a wide variety of other species, and euthanizing drugs such as Fatal Plus®. These drugs are regulated by FDA under the Food, Drug, and Cosmetic Act and WS policy. The chemicals used by KWSP from FY02 to FY06 are shown in Table 3 with the species they were used to control. KWSP used an average of about 23 pounds of DRC-1339, 39 ounces of Avitrol®, 2.8 grams of A-C, and 0.2 cc Fatal Plus®. This is a minimal use of chemicals.

Table 3. Chemicals used by KWSP in BDM from FY02 to FY06. Avian toxicants (DRC-1339 and Avitrol®) are registered for use by EPA and animal immobilization (A-C) and euthanasia (Fatal Plus®) drugs through FDA.

Species	Chemical	FY02	FY03	FY04	FY05	FY06	Ave.
European Starling	**DRC-1339 (g)**	1,724	14,220	9,979	5,103	7,258	7,657
Mixed Blackbird (12/1-3/31)		1,706	3,175	454	839	0	1,235
Mixed Blackbird (4/1-11/30)		680	2,722	907	907	1,814	1,406
Feral Pigeon		34	17	0	3	34	18
Brown-headed Cowbird		-	-	-	-	227	45
TOTAL DRC-1339 USED		4,144	20,134	11,340	6,852	9,333	10,361
House Sparrow	**Avitrol® (oz)**	-	20	60	13	9	20
European Starling		-	-	-	44	20	13
Feral Pigeon		-	-	-	23	7	6
TOTAL AVITROL USED		0	20	60	80	36	39
Canada Goose	**A-C (mg)***	962	818	6,936	2,622	8,900	4,048
Mallard		901	-	-	-	-	180
TOTAL A-C USED		1,863	818	6.936	2,622	8,900	2,842
Barred Owl**	**Fatal Plus® (cc)**	-	-	1	-	-	0.2

* Some birds captured with A-C were surveyed and released or relocated, and not euthanized.
** Captured by hand (injured by car) and euthanized with Fatal Plus®

Some people may be concerned that WS' use of firearms and pyrotechnic bird scaring devices could cause injuries to people. KWSP 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, 05/03/02). The required firearms training is conducted biennially by certified instructors. Hands-on firearms proficiency is evaluated in the field and candidates must pass a written exam. Therefore, firearms are handled in a safe manner with consideration given to the proper firearm to be utilized, the target density, backstop and unique field conditions. Pyrotechnics often emit sparks when launched, creating some potential fire hazard to private property from field use. Before the implementation of formalized training standards, other states reported incidents where small fires were started from the use of pyrotechnics in the field. Pyrotechnics storage, transportation, and use are regulated by the Alcohol, Tobacco and Firearms Bureau, Department of Transportation, and WS policy respectively. WS requires adherence to all Federal, State and local laws. Pyrotechnics on-hand are less than 50 lbs. in total weight; that, along with industry approved packaging of the materials allow Kansas WS' pyrotechnics to be classified as Division 1.4 (formally known as Class C), the lowest classification of explosive materials as defined by the Alcohol, Tobacco and Firearms Bureau. Pyrotechnics are stored and transported in approved metal boxes. Training for pyrotechnics field use is also conducted and maintained under the WS Firearms Safety Training Manual guidelines.

A formal risk assessment of WS methods concluded low risks to humans (USDA 1997, Appendix P) including BDM methods used by KWSP such as toxicants, repellents, immobilization drugs, firearms, pyrotechnics, and traps. Under the proposed action, KWSP could use DRC-1339, Avitrol®, A-C, and euthanasia drugs such as Fatal Plus®. From FY02 to FY06 KWSP used an annual average of 370 oz. of DRC-1339, 39 oz. of Avitrol®, and 4,228 mg of A-C. Additionally, an injured owl was given a lethal dose of Fatal Plus®, the only bird species euthanized in the 5 years. 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 1997).

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 (represent a significant strike risk to aircraft at airports and have been struck by aircraft. This can result in damage and injuries to people. Additionally disease, 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 KWSP BDM activities is the potential for adverse effects from not having professional assistance from programs like KWSP available to private entities that express needs for such services. KWSP 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 include 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, KWSP 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 resort to inadvisable techniques.

2.1.4 Effects of BDM on Aesthetics

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

Some people do not believe that birds such as nesting Canada Geese or nuisance egret, blackbird, or starling roosts should even be harassed to stop or reduce damage problems. Some of them are concerned that their ability to view migratory birds is lessened by KWSP nonlethal harassment activities. The public’s ability to view wild birds in a particular area would be more limited if the wildlife are removed or relocated. However, immigration of wildlife from other areas could possibly replace the animals removed or relocated during a damage management action. 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.

2.1.5 Issues that Were Analyzed in Prior EAs (WS 2001) that Will Not Receive Detailed Analysis under the Alternatives in This EA, but Some Background Information Will Be Discussed

In addition to the above issues, several other issues were analyzed thoroughly in the previous Kansas Bird EA (WS 2001) as well as other WS EAs and USDA (1997), and their analyses would be almost identical in this EA so these will not be considered further. The environmental consequences of these issues were found to have the least impacts under the current program alternative, the same in this EA except this EA is being considered at the statewide level. Even though these issues are not analyzed in this EA, some of these issues are still considered in determining SOPs to minimize potential impacts. Following are two issues that were sufficiently discussed in the prior EA (WS 2001) and showed little or no change. Subsequently, these will not be addressed in this EA, except where SOPs are developed to minimize impacts of these issues as necessary.

2.1.5.1 Selectivity and Humaneness of BDM Methods. Selectivity of BDM methods is related to the issue of humaneness in that greater selectivity results in less perceived suffering of nontarget animals. The selectivity of each method is based, in part, on the skill and discretion of the KWSP Specialist in applying such methods and on specific measures and modifications designed to reduce or minimize nontarget captures. The humaneness of a given WDM method is based on the human perception of the pain or anxiety caused to the animal by the method. How each method is perceived often differs, depending on the person's familiarity and perception of the issue as discussed in Section 2.3.5. The selectivity and humaneness of each alternative are based on the methods employed and who employs them under the different alternatives. Schmidt and Brunson (1995) conducted a public attitude survey in which respondents were asked to rate a variety of WDM methods on humaneness (1=not humane, 5= humane) based on their individual perceptions of the methods. Their survey found that the public believes that nonlethal methods such as animal husbandry, fences, and scare devices were the most humane and traps, snares, and aerial hunting were the least humane. The previous Bird EA for Kansas (WS 2001) and many other WS EAs have discussed how selective each of the methods used in Kansas to take target animals was and information on their humaneness.

In comparison, under the No Federal Program Alternative, the federal portion of KWSP would not employ methods viewed by some as inhumane and, thus, have no program effect on humaneness. KDWP, KDA, or Kansas State University Cooperative Extension Service would probably still provide some level of hands on professional BDM assistance, but without federal supervision. They would continue to use the BDM methods considered inhumane by some, but at lower levels. The State personnel would not receive training from federal sources, nor would the program benefit from federal research focused on improved humaneness, selectivity, and non-lethal methods. Private individuals that have experienced resource losses, but are no longer provided professional assistance from KWSP, could conduct lethal BDM on their own. Use of Avitrol®, traps, and shooting by private individuals would probably increase. This could result in less experienced persons implementing BDM methods such as traps without appropriate modifications to reduce stress of the target animal and take of nontarget animals. Greater take or suffering of both nontarget and target wildlife would likely be the result. Therefore, it was concluded that the No Federal Program Alternative would result in the highest potential for negative effects from BDM (WS 2001). Additionally, it is hypothetically possible that frustration caused by the inability of resource owners to reduce losses could lead to the illegal use of chemical toxicants. The illegal use of toxicants could also result in increased animal suffering.

BDM conducted by private individuals would probably be less humane than BDM conducted under the auspices of a federal BDM program. KWSP is accountable to public input and humane interest groups that often focus their attention and opposition on BDM activities employed by KWSP. BDM methods used by private individuals may be more clandestine, and in particular, those that are used illegally. Members of the public that perceive some BDM methods as inhumane would be less aware of BDM activities being conducted by private individuals because private individuals would not be required to provide information under mandatory policies or regulations similar to those applied to KWSP. Thus, the perception of inhumane activities could be reduced, although the actual occurrence of BDM and associated inhumane activities may increase.

The No Federal Program Alternative would likely result in more negative impacts with regard to humaneness than the current program. The other alternatives analyzed in this EA were also analyzed in the previous EA (WS 2001) and found to lie between the Current Program and No Federal Program Alternatives. These will not be discussed further. However, humaneness is a concern of KWSP and is a criteria used to help determine the appropriate SOPs to maximize method selectivity and humaneness. The current program conducted by KWSP has not taken a known nontarget species in the last 10 FYs.

2.1.5.2 Effects of BDM on Water Quality and Wetlands. Two issues arose regarding water quality and wetlands in the prior EA (WS 2001) that were sufficiently discussed.

Potential for BDM Chemicals to Run off site and Affect Aquatic Organisms. An issue that was raised during an interagency discussion while working on the previous EA (WS 2001) was the potential for

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

Available information suggests DRC-1339 has low potential for aquatic and invertebrate toxicity (USDA 1997). Aquatic toxicity of DRC-1339 to water fleas occurred at 1.6 mg/L (Marking and Chandler 1981, Blasberg and Herzog 1991). The majority of LC_{50} (lethal concentration of a chemical in water in mg/L that is expected to kill 50 percent of the test subjects of a given species) values ranged from 6 to 18 mg/L for such species as glass shrimp, snails, crayfish, and Asiatic clams (Marking and Chandler 1981). LC_{50} values for bluegill and catfish ranged from 21 to 38 mg/L (USDA 1997, Appendix P). The greatest quantity that might be used by KWSP at an individual site at any one time is expected to be 16 ounces (454g). If all of the 16 ounces of chemical was transported off site and made it to surface or ground water, the water supply would have to be no more than 75,000 gallons in size to present a 50% lethal hazard to water fleas, no more than 6,700 to 20,000 gallons in size to present such a hazard to other invertebrates, or no more than 3,200 to 5,700 gallons to present such a hazard to bluegills or catfish. Put in perspective, 75,000 gallons is equivalent to a pond that is about 65 feet across and averages only 3 feet deep. These water volumes are much smaller than are likely to be encountered in streams or lakes in the area, and, undoubtedly, only a tiny fraction of the ground-water supply in the area. Because treated bait material is not applied unless target birds are already taking a similar amount of untreated bait, it is highly unlikely that much, if any, of the chemical would be left on the ground where it would be subjected to off-site transport by rainfall. The risk is further mitigated by the fact that the chemical degrades rapidly as discussed above. USDA (1997, Appendix P) concluded no probable risk to aquatic organisms. This analysis further indicates that the low quantities used at any one site, rapid degradation, and dilution factors act together to virtually eliminate any potential for hazard to humans or aquatic organisms due to possible run-off or ground water. Therefore, KWSP concluded in the previous EA (WS 2001) that the use of DRC-1339 would not cause runoff problems or affect aquatic organisms.

The other primary chemical used by KWSP, Avitrol®, is used minimally (ave. 39 oz. from FY02 to FY06) 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, KWSP 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. Under this alternative KWSP expects that up to 3 million starlings and 1 million blackbirds would be killed by use of DRC-1339 and that the majority of these would die in nighttime roost sites. Some of the primary roost sites where this would occur are in cattail marshes. Large numbers of wintering blackbirds and starlings are known to roost in some of the wetland cattail marsh habitats within Kansas (Zimmerman 1990). The delayed mode of action of DRC-1339 is such that most of the birds would not become lethargic and die until they were in their nighttime roosts. Thus, it is estimated that the carcasses of as many as 4 million starlings and blackbirds could be deposited into cattail marshes as a result of WS' activities in Kansas in any one year.

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

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

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

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

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

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

Phosphorus is frequently the limiting nutrient in freshwater systems (Cole 1975). Therefore, increases in phosphorus are frequently the primary cause of accelerated eutrophication. The amount of phosphorus in carcasses of starlings, blackbirds, or other passerine bird species was not found in the literature. However, Williams et al. (1978) reported that phosphorus content in the oven-dried carcasses of chicks of four species of penguins ranged from 3,000 to 22,500 ppm (parts per million). Potassium content was reported to range from 700 to 12,900 ppm. Assuming the higher end of these ranges would apply to blackbirds and starlings (to err on the side of overestimating), the 73,000 kg (dry weight) of blackbird and starling carcasses that might be killed and deposited in a cattail marsh roost site would put as much as 1,650 kg of phosphorus and 940 kg of potassium into the particular wetland ecosystem affected. On the other hand, if they were not killed, those same birds would deposit about 5,000 kg of phosphorus and

4,900 kg of potassium over a 90-day wintering period via droppings (based on Hayes and Caslick 1984). Therefore, it appears that use of DRC-1339, as proposed herein, would not result in any net increase in the two nutrients in wetland ecosystems. This means that accelerated eutrophication would not be expected to occur from BDM activities.

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

2.2 ISSUES USED TO DEVELOP WS SOPs FOR BDM

2.2.1 Effects on Target Bird Species Populations

KWSP annually monitors target bird take in BDM and sport harvest to determine if take has remained within the range analyzed by the EA. Thus far, KWSP has not exceeded a significant level of take as analyzed in the prior EA for certain species of birds (WS 2001). However, all bird species taken in BDM are being considered in this EA and bird populations and abundance can change, and, therefore, their populations would be considered and monitored annually. KWSP SOPs, discussed in Section 3.4, ensure that the take of birds remains below a sustainable harvest, unless the managing agency has different management goals.

2.2.2 Effects on Nontarget Species Populations, Including T&E Species

Special efforts are made to avoid taking nontargets during BDM or jeopardizing T&E species. The selectivity of BDM methods has been improving through the years, and much credit goes to WS' National Wildlife Research Center (NWRC). Improved cage traps, baits, hazing techniques, and other BDM tools and the development of new methods such as lasers have helped KWSP Specialists be more efficient and effective at focusing efforts on the target species while minimizing take of nontarget species. T&E species are avoided by conducting biological evaluations of the potential effects and the establishment of special restrictions or measures to reduce the potential for take, and consultation with USFWS and KDWP biologists. KWSP SOPs include measures intended to reduce the effects of BDM on nontarget species populations, especially T&E species, and are presented in Section 3.4.

2.2.3 Effects on Public and Pet Safety and the Environment

KWSP Specialists have SOPs to reduce potential safety impacts from BDM to the public, pets, and the environment. KWSP relies on its Specialists 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, pets, and the environment. KWSP Specialists are professionally trained to use BDM techniques, especially those that could 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. Measures to reduce potential problems are given in Chapter 3. KWSP has not had any known impacts from BDM on the public, pets, or the environment from FY02 to FY06.

As discussed in Section 2.1.3, a peripheral factor pertinent to assessing the risk of adverse effects of KWSP BDM activities is the potential for adverse effects from not having professional assistance from programs like KWSP available to private entities that express needs for such services. KWSP 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 State agencies and 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 include the use of unwise or illegal methods to control birds. Therefore, KWSP 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 resort to inadvisable techniques.

2.2.4 Effects of BDM on Aesthetics

Under the proposed action, KWSP would kill what some people would perceive to be a large number of birds. There may be some people who enjoy seeing birds. If so, those people might feel their interests were being harmed. However, the population impacts analysis in Section 4.1.1 indicates the overall populations of birds are not being significantly affected, which means opportunities to view these species would continue to exist.

WS's experience has generally been that, whereas many people perceive some pleasure or enjoyment at seeing relatively small concentrations of birds, most people directly affected by birds, especially large wintering concentrations, perceive them as an annoyance or a health hazard. Reductions in large wintering concentrations of birds such as starlings would be viewed by those people as an aesthetic improvement. Concentrations of roosting birds have resulted in calls to the KWSP office in Kansas concerning nuisance noise, odor and fecal contamination. Some towns such as Dodge City have had active harassment programs in order to move birds from urban areas.

It is possible that some birds killed with DRC-1339, due to its slow action, would die in nighttime roost sites in trees or wooded areas near to or in urban or suburban areas. This has been known to happen. Also, some birds might die en route to nighttime roost sites with DRC-1339 use, despite the tendency for most birds to die at their nighttime roost sites, and be visible to passers by. This would be particularly noticeable if they fall onto snow covered areas where the black bodies would contrast sharply with the white snow. If this occurs, some people might perceive these numbers of dead birds to be aesthetically displeasing. KWSP would plan to mitigate this effect by retrieving visible dead birds following baiting operations, or by requiring facility managers to provide personnel to pick up visible dead birds as a condition of receiving KWSP operational service. However, this depends on receiving permission to trespass by property owners).

Measures and policies are in place that help minimize the effects of KWSP activities on aesthetics as much as possible. KWSP personnel post signs in prominent places to alert the public that BDM tools are set in an area and this would allow the public offended by BDM activities to avoid these areas. On private lands, the cooperators or landowners are aware that BDM methods are set and can alert guests using the property of their presence. Landowners determine the areas and timing of equipment placement, thereby avoiding conflicts with the public, especially those that would find BDM aesthetically displeasing. For public lands, KWSP abides by all applicable laws and regulations regarding the use of different BDM methods. KWSP coordinates with the different land management agencies to determine high-use public areas and times of the year. KWSP limits conducting BDM in high-use public areas or limits the BDM methods used to minimize potential problems with those people that find BDM aesthetically displeasing.

2.2.5 Humaneness of Methods Used by KWSP

The issue of humaneness and animal welfare as it relates to killing or capturing wildlife is an important and very complex concept that can be interpreted in a variety of ways. Schmidt (1989) indicated that vertebrate pest damage management for societal benefits could be compatible with animal welfare concerns if "*. . . the reduction of pain, suffering, and unnecessary death is incorporated in the decision making process.*" Suffering is described as a "*. . . highly unpleasant emotional response usually associated with pain and distress.*" However, suffering "*. . . can occur without pain . . .*" and "*. . . pain can occur without suffering . . .*" (American Veterinary Medical Association 1987). Because suffering carries with it the implication of a time frame, a case could be made for "*. . . little or no suffering where death comes immediately . . .*" (California Department of Fish and Game 1991), such as shooting. Defining pain as a component of humaneness and animal welfare in BDM methods used by KWSP appears to be a greater challenge than that of suffering. Pain obviously occurs in animals. Altered physiology and behavior can be indicators of pain, and identifying the causes that elicit pain responses in humans would "*. . . probably be causes for pain in other animals . . .*" (American Veterinary Medical Association 1987). However, pain experienced by individual animals probably ranges from little or no pain to significant pain (California Department of Fish and Game 1991). Pain and suffering, as it relates to damage management methods, has both a professional and lay point of arbitration. Wildlife managers and the public would be better served to recognize the complexity of defining suffering since "*. . . neither medical nor veterinary curricula explicitly address suffering or its relief*" (California Department of Fish and Game 1991).

The American Veterinary Medical Association states, "*... euthanasia is the act of inducing humane death in an animal*" and "*... the technique should minimize any stress and anxiety experienced by the animal prior to unconsciousness.*" (Beaver et al. 2001). Some people would prefer accepted methods of euthanasia to be used when killing all animals, including wild and feral animals. The American Veterinary Medical Association states, "*For wild and feral animals, many of the recommended means of euthanasia for captive animals are not feasible. In field circumstances, wildlife biologists generally do not use the term euthanasia, but use terms such as killing, collecting or harvesting, recognizing that a distress-free death may not be possible.*" (Beaver et al. 2001).

Some individuals and groups are opposed to some management actions of KWSP. KWSP personnel are experienced and professional in their use of management methods. This experience and professionalism allows KWSP personnel to use equipment and techniques that are as humane as possible within the constraints of current technology. Professional BDM activities are often more humane than nature itself (i.e., death from starvation) because these activities can produce quicker deaths that cause less suffering. Research suggests that with some methods, such as restraint in leghold traps, changes in the blood chemistry of trapped animals indicate "stress." Blood measurements indicated similar changes in foxes that had been chased by dogs for about five minutes as those restrained in traps (USDA 1997). However, such research has not yet progressed to the development of objective, quantitative measurements of pain or stress for use in evaluating humaneness. People concerned with animal welfare often express that they would like to see animal suffering minimized as much as possible and that unnecessary suffering be eliminated. The interpretation of what is unnecessary suffering is the point to debate (Schmidt 1989).

Humaneness, as perceived by the livestock industry and pet owners, requires that domestic animals be protected from predatory birds because humans have bred many of the natural defense capabilities out of domestic animals. It has been argued that man has a moral obligation to protect these animals from all predators (USDA 1997). Predators frequently do not kill larger prey animals quickly, and will often begin feeding on them while they are still alive and conscious (Wade and Bowns 1982). The suffering apparently endured by livestock damaged in this manner is unacceptable to many people.

Thus, the decision-making process involves tradeoffs between the above aspects of pain and humaneness. Objective SOPs to minimize impacts from this issue must consider not only the welfare of wild animals, but also the welfare of humans if damage management methods were not used. Therefore, humaneness, in part, appears to be a person's perception of harm or pain inflicted on an animal. People may perceive the humaneness of an action differently. The challenge in coping with this issue is how to achieve the least amount of animal suffering within the constraints imposed by current technology and funding.

WS has improved the selectivity of management devices through research and development of pan-tension devices, break-away snares, and chemical immobilization/euthanasia procedures that minimize pain. Research continues to improve selectivity, practicality, and humaneness of management devices (USDA 1997). Until new findings and products are found to be practical, a certain amount of animal suffering will occur if BDM objectives are to be met in those situations where nonlethal BDM methods are ineffective or impractical. Furthermore, if it were possible to quantify suffering, it is possible that the actual net amount of animal suffering would be less under the proposed action (or any other alternative involving the use of lethal methods) than under the No Federal BDM Alternative since suffering experienced by livestock preyed upon by predators is reduced if BDM is successful in abating predation. Measures to reduce pain and stress in animals and SOPs used to maximize humaneness are listed in Chapter 3.

2.3 ISSUES CONSIDERED BUT NOT IN DETAIL WITH RATIONALE

In addition to the above issues, several other issues were analyzed thoroughly in the previous EA (WS 2001), and the analyses for these issues would be identical in this EA even though this EA is for all birds and resources in Kansas and not just blackbirds, starlings, pigeons and House Sparrows at livestock feeding facilities. No new information has arisen that would change the analysis provided in that document or suggest a need for their inclusion here in the issues considered in the comparison of alternatives. Therefore, analyses of the following issues can be found in the previous EA (WS 2001) and not repeated in this EA.

- WS's Impact on Biodiversity
- Wildlife Damage Is a Cost of Doing Business, a "Threshold of Loss" Should Be Established before Allowing Any BDM
- Potential for Avian Cholera and Botulism to Result from Killing Blackbirds
- Potential Issues Related to Environmental Justice and Executive Order 12898
- Lethal BDM for Blackbirds and Starlings Is Futile Because 50-60% of Them Die Each Year Anyway
- Cost Effectiveness of BDM
- Beneficial Effect on Songbird Populations from Killing Brown-headed Cowbirds
- Protection of Children from Environmental Health and Safety Risks (Executive Order 13045)

Following are additional issues that that may have been discussed in the previous EA (WS 2001), but will be repeated here for clarity, or are new issues that have arisen since the previous EA, but will not be considered for inclusion under the alternatives with justification

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

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

2.3.2 Effects from the Use of Lead in Ammunition

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

The amount of lead deposited on the landscape from the firing of shotguns and rifles during BDM is very small since the amount of land area involved is huge, 225,000 acres annual average for WDM (FY04 to FY06). KWSP uses firearms for many WDM activities in Kansas including ground-based, aerial, and harassment shooting, and shooting to euthanize animals caught in traps. KWSP uses steel shot to take all birds listed on a migratory bird permit from USFWS, thus shots at migratory birds are with nontoxic shot. KWSP tracks ground-based and aerial shooting activities, number of birds or mammals dispersed from harassment shooting, and animals killed in traps. If we assume that for ground-based and aerial shooting that 3 shots are fired for every animal taken, 100 birds (often flocks are in the thousands that are dispersed) and 1 mammal are dispersed with harassment shooting, and that one shot is fired to euthanize animals in traps (less those euthanized chemically), then an average of about 27,000 shots were fired annually from FY04 to FY06 (this is likely much higher than the number of shots fired by several fold). However, shots fired are not tracked in the MIS, and, therefore, to err on the side of being conservative, we will assume this many shots were taken with lead. Even so, the number of shots are relatively minimal and scattered over considerable portions of the landscape. WS shooting for all species taken (including birds) or hazed (harassment shooting) in WDM occurs on small proportion of the land area in Kansas, about 0.4% of the land area. The land area of exposure to shots fired is still relatively large in relation to the amount of shot distributed. When shotshells with lead are used in hazing or shooting, the typical amount of lead distributed by each shot is from 1.0 to 1.5 oz. (most bird shot is 1.0 to 1.2 oz./shell and over 90% of the shooting conducted by KWSP is for BDM). High-powered rifle bullets are about 0.3 oz. and about 0.1 oz. for small caliber firearms and pellets for air rifles). KWSP uses shotguns for about 90% of the shooting in Kansas. About 10% of the shooting is with air rifles (~0.1 oz. each at most). High-powered rifles and small caliber pistols (.22) are used for mammals, but this is minimal and less than 1%. It should be noted that the majority of animals shot by WS are retrieved and disposed of where they are not available to avian scavengers, the species of most concern for lead poisoning. However, assuming that the carcasses do not retain the shot or bullets, we can determine the amount of lead deposited over the landscape by KWSP. KWSP potentially deposits about 2,000 lbs. of lead from shotshells (assuming 1.2 oz./shell for 90% of the shooting and 0.1 oz. pellet for 10% of the shooting) over about 225,000 acres in Kansas. This amounts to an average of about 0.14 oz. (4 g) lead/acre. Thus, about an ounce of lead is distributed over 7 acres from KWSP BDM. Even though this is a small amount, to address even the most extremely unrealistic concerns raised regarding this issue, we have looked at the following detailed scientific facts and data related to any potential exposure of lead resulting from the lead shot used by KWSP in all WDM activities. It should be noted that hunting is not allowed on the majority of lands under agreement where KWSP conducts BDM (e.g., airports and feedlots), thus cumulative impacts on these lands would not include upland game hunting (nontoxic shot is required for waterfowl hunting),

The hazard standard set by EPA for lead concentrations in residential soils is 400 ppm (1 part per million is equivalent to 1 mg/kg or 0.0064 oz./lb.) in children's play areas, and 1,200 ppm on average for the rest of a residential yard[1]. We are unaware of any established standards for lead contamination of soil in remote rural areas of the kind where KWSP conducts some WDM activities, but it is reasonable to assume the guideline for residential areas would be more stringent than any such standard that might ever be established for rural areas. Laidlaw et al. (2005) reported that, because of the low mobility of lead in soil, all of the lead that accumulates on the surface layer of the soil is generally retained within the top 20 cm (about 8 inches). A representative average weight of soil is in the range of 110 lbs. (49.9 kg) per cubic foot (Environmental Working Group 2007). The number of cubic feet of soil in the top 8 inches of soil in one acre is about 29,000. Therefore, a reasonable estimate of the total weight of the top layer of soil per acre where spent lead shot should remain would be 3.2 million lbs. (110 x 29,000) or 1.5 million kg. If considered over the amount of land area involved in WDM in the State during a typical year, the amount of lead distributed from KWSP WDM activities would constitute an average of about 0.003 mg/kg of soil (at 0.14 oz./acre). This is a small fraction, 130,000 times less than the concentration in the EPA hazard standards for residential area soils shown above. Soil uncontaminated by human activities generally contains lead levels up to about 50 ppm (or 50 mg/kg) (Agency for Toxic Substances and Disease Registry 2005), far more than the 0.003. Assuming that the soils in the areas where KWSP conducts WDM have the upper limit of this baseline level, it would take an additional 350 mg/kg to reach the EPA hazard standard for children's playgrounds, and 1,150 mg/kg to reach the standard for other residential yard areas. It would take over 100,000 years for enough lead to accumulate from shooting by KWSP to reach the EPA hazard standard for children's playgrounds.

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[1] The EPA soil-lead hazard is bare soil on residential real property or on the property of a child occupied facility that contains total lead equal to or exceeding 400 parts per million (mg/g) in a play area or average of 1,200 parts per million of bare soil in the rest of the yard based on soil samples. 40 CFR 745.65(c)

A remaining question is whether lead shot deposited in remote areas by KWSP might lead to contamination of water, either ground water or surface water via runoff that occurs during or following rainfall or melting snow cover. Stansley et al. (1992) found that lead did not appear to "transport" readily in surface water when soils are neutral or slightly alkaline in pH (i.e., not acidic), but that it will transport more readily under slightly acidic conditions. In their study, they looked at lead levels in water that was subjected directly to high concentrations of lead shot accumulation because of intensive target shooting at several shooting ranges. Although they detected elevated lead levels in water in a stream and a marsh that were in the shot "fall zones", they did not find higher lead levels in a lake into which the stream drained, except for one sample collected near a parking lot where it was believed the lead contamination was due to water runoff from the parking lot, and not from the shooting range areas. Their study indicated that even when lead shot is highly accumulated in areas with permanent water bodies present, the lead does not necessarily cause elevated lead contamination of water further downstream. They also reported that muscle samples from two species of fish collected in the 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 of the impact areas were far below the EPA's "action level" (i.e., requiring action to treat the water to remove lead) of 15 ppb ("parts per billion"). They reported 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 in the impact areas. This means "transport" of lead from bullets or shot distributed across the landscape is reduced once the bullets and shot form these crusty lead oxide deposits on their surfaces, which serves to naturally further reduce the potential for ground or surface water contamination. These studies suggest that, given the very low and highly scattered shot concentrations that occur from KWSP's WDM shooting activities, as well as most other forms of dry land small game hunting in general, lead contamination of water from such sources would be minimal to nonexistent. Based on the above analysis, we conclude that the amounts of lead deposited by KWSP WDM operations are far below any level that would pose any risk to public health or of significant contamination of water supplies.

In a review of lead toxicity threats to the California Condor (*Gymnogyps californianus*), Center for Biological Diversity et al. (2004) concluded that lead deposits in soils, including those caused by target shooting by the military at shooting ranges on military reservations used by condors, did not pose significant threats to the condor. The concern was that lead might bio-accumulate in herbivores that fed on plants that might uptake the lead from the soil where the target ranges were located. However, Center for Biological Diversity et al. (2004) reported blood samples from condors that foraged at the military reservation where the target shooting occurred did not show elevated lead levels, and, in fact showed lower lead levels than samples from condors using other areas. Because lead deposited by KWSP's WDM activities is widely scattered in comparison to military shooting ranges, it is clear that, despite valid concerns about other sources of lead toxicity in the environment, lead deposited onto the landscape by KWSP should not cause any significant impacts on wildlife, nor should it contribute in any significant way to cumulative impacts from other sources of lead shot deposited by sport hunting. However, there appears to be a growing body of evidence that lead bullets and shot remaining in carcasses of animals that are shot but not removed from the landscape can pose lead toxicity problems for scavenging California condors (Center for Biological Diversity et al. 2004). These concerns have also arisen regarding lead poisoning from Bald Eagles scavenging predators that have been shot. The KWSP Program has tried various nontoxic (non-lead) shot loads to reduce the concern of lead poisoning, and continues to move in this direction as new nontoxic ammunition is developed that is effective for WDM. However, some evidence has shown that the threat of lead toxicity to eagles is not as severe as previously thought. Hayes (1993) reviewed literature and analyzed the hazard of lead shot to raptors, in particular eagles from aerial hunting by WS. Key findings of that review were:

- Eagles are known to scavenge on bird and mammal carcasses, particularly when other food sources are scarce or when food demands are increased.

- In studies that documented lead shot consumption by eagles (i.e., based on examining the contents of regurgitated pellets), the shot was associated with waterfowl, upland game bird, or rabbit remains, and was smaller than BB or #4 buckshot used in aerial hunting. Lead levels have been detected in eagle blood samples, but the source of the exposure was unknown. Lead residues have been documented in jackrabbits, voles (*Microtus sp.*), and ground squirrels which can explain how eagles could ingest lead from sources other than lead shot. In one study (Pattee et al. 1981), four of five captive Bald Eagles force fed uncoated lead shot died and the fifth went blind. Frenzel and Anthony (1989) suggested, however, that eagles usually reduce the amount of time that lead shot stays in their digestive systems by casting most of the shot along with other indigestible material. It appears that healthy eagles usually regurgitate lead shot in pellet castings which reduces the potential for lead to be absorbed into the blood stream (Pattee et al. 1981; Frenzel and Anthony 1989).

- WS personnel examined nine coyotes shot with copper plated BB shot to determine the numbers of shot retained by the carcasses. A total of 59 BBs were recovered, averaging 6.5 pellets per coyote. Of the 59 recovered pellets, 84% were amassed just under the surface of the hide opposite the side of the coyote that the shot entered, many exhibited minute cracks of the copper plating, and two shot pellets were split. The fired shot were weighed and compared with unfired shot and were found to have retained 96% of their original weight. Eagles generally peel back the hide from carcasses to consume muscle tissue. Because most shot retained by coyotes tends to end up just under the hide, it would most likely be discarded with the hide. Any shot consumed would most likely still have the nontoxic copper plating largely intact, reducing the exposure of the lead to the digestive system. These factors, combined with the usual behavior of regurgitation of ingested lead shot indicate a low potential for toxic absorption of lead from feeding on coyotes killed by aerial hunting.

The above analysis indicates adverse effects on eagles from scavenging on animals killed in WDM are unlikely. The USFWS did not identify this as a concern in the 1992 BO (USDA 1997, Appendix F) which covered potential adverse effects on Bald Eagles from all WS used WDM methods, including shooting. Bald Eagle populations appear to be increasing in the contiguous 48 states and have met or exceeded recovery goals in several states. Golden Eagle populations appear to be healthy, but show nonsignificant trends in the Breeding Bird Survey. Breeding Bird Survey data indicate a general increasing trend in breeding populations of both Golden Eagles (nonsignificant +1.0, $P=0.54$) and Bald Eagles (significant +6.1, $P=0.01$) in North America since 1966 (Sauer et al. 2006). Thus, eagle populations do not appear to be significantly adversely affected by lead toxicity problems. KWSP retrieves shot carcasses where practical and disposes of them in an area where eagles and other scavengers such as hawks would not be able to scavenge on them. In addition, KWSP uses nontoxic shot where eagles have been documented recently. In addition, no evidence has been brought forth to indicate that any animals killed during WDM by KWSP have resulted in any indirect lead poisoning of scavenging eagles or other animals.

2.3.3 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.

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

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

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

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

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

2.3.7 Impacts on the Natural Environment Not Considered

USDA (1997) evaluated many KWSP 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.

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

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 KWSP Only.** Under this alternative, WS would use only nonlethal methods in BDM. KWSP could still recommend the use of lethal methods, but would not partake in implementing them.

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

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

3.2 DESCRIPTION OF THE ALTERNATIVES

3.2.1 Alternative 1 – Continue the Current Federal BDM Program

The No Action Alternative is a procedural NEPA requirement (40 CFR 1502), is a viable and reasonable alternative that could be selected, and serves as a baseline for comparison with the other alternatives. The No Action Alternative, as defined here, is consistent with Council on Environmental Quality's definition. The proposed action is to continue the current portion of KWSP that responds to requests for BDM to protect human health and safety, agricultural and natural resources, and property as discussed in Section 1.3, and conduct surveillance projects involving birds as needed. A major component of the current program is the protection of human health and safety and property from wildlife strikes to aircraft. The 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 KWSP 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 KWSP Specialists or Biologists 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 KWSP would include shooting, trapping, egg addling/destruction, DRC- 1339, Avitrol®, or euthanasia following live capture by trapping, hand capture, nets, or use of A-C). Nonlethal methods used by KWSP may include porcupine wire deterrents, wire barriers and deterrents, the tranquilizer A-C, 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, KWSP only function would be to implement lethal methods, if any were determined to be necessary to resolve a damage problem. BDM by KWSP 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 Agreement for Control. All management actions would comply with appropriate federal, state, and local laws. Appendix E provides a more detailed description of the methods that could be used under the proposed action.

3.2.2 Alternative 2 - Nonlethal BDM by KWSP Only

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

3.2.3 Alternative 3 - KWSP Provides Technical Assistance Only for BDM

This alternative would not allow for KWSP operational BDM in Kansas. KWSP would only provide technical assistance and make recommendations when requested. Producers, property owners, State and local agency personnel, or others could conduct BDM using traps, shooting, Avitrol®, or any nonlethal method that is legal. Avitrol® could only be used by State certified pesticide applicators. Currently, DRC-1339 and A-C are only available for use by KWSP 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 KWSP BDM

This alternative would eliminate federal involvement in BDM in Kansas. KWSP would not provide direct operational or technical assistance and requestors of KWSP services would have to conduct their own BDM without KWSP input. This alternative was discussed in detail in USDA (1997). 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 and A-C 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 KWSP 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 terminate both KWSP technical assistance and operational BDM by KWSP.

3.3.1 Alternative 1 – Continue the Current Federal BDM Program

KWSP currently uses many of the BDM methods available for use. Some BDM methods are widely used, while others are used infrequently. KWSP recommends the use of many BDM methods, but does not implement them. The BDM methods available for use are described in Section3.1.3.3.

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 KWSP under the current BDM program.

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

3.3.1.2 KWSP Decision Making. KWSP 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. KWSP 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 (Slate et al. 1992) (Figure 3 in Section 1.6.4). 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 KWSP conducts BDM illustrating the WS Decision Making process.

European Starling Problems

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

Feral Domestic Pigeon Problems

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

3.3.1.3 BDM Methods Available for Use. WS has been conducting WDM in the United States for more than 85 years. WS has modified WDM activities to reflect societal values and minimize impacts to people, wildlife, and the environment. The efforts have involved research and development of new field methods and the implementation of effective strategies to resolve wildlife damage. KWSP 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 KWSP 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 KWSP, but KWSP 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. KWSP encourages resource owners to use these strategies where they may be beneficial, but does not conduct these techniques operationally.

Guard Animals. Guard animals are used in WDM to protect a variety of resources and can provide significant protection at times. Guard animals (i.e., dogs, burros, and llamas) have proven successful in many sheep and goat operations. The effectiveness of guarding animals may not be sufficient in areas where there is a high density of wildlife to be deterred, where the resource, such as sheep foraging on open range, is widely scattered, or where the guard animal to resource ratios are less than recommended. KWSP often recommends the use of guard animals, but has not had an operational guard animal program.

Several breeds of dogs such as the Great Pyrenees and Komondor have been used to protect sheep and goats. Border collies and other dogs have been very effective for Canada Goose damage reduction at parks and golf courses. However, the supply and longevity of proven guard dogs is generally quite limited. Resource owners typically must purchase and rear their own guarding dog. Therefore, a 4 to 8 month lag-time is necessary to raise a guarding dog before it becomes an effective deterrent to wildlife such as coyotes and geese. Since 25% to 30% of dogs are unsuccessful, the first dog raised as a protector may not be useful. Guard dogs may be ineffective for a number of reasons, but usually because they kill the livestock they are protecting, or because they do not stay with the livestock they are intended to guard. Guard dogs can harass and kill nontarget wildlife while protecting resources (Timm and Schmidt 1986).

They do have the potential for capturing any of the mammalian and avian T&E predators if they tried to depredate on the resource being protected (i.e., lambs).

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.

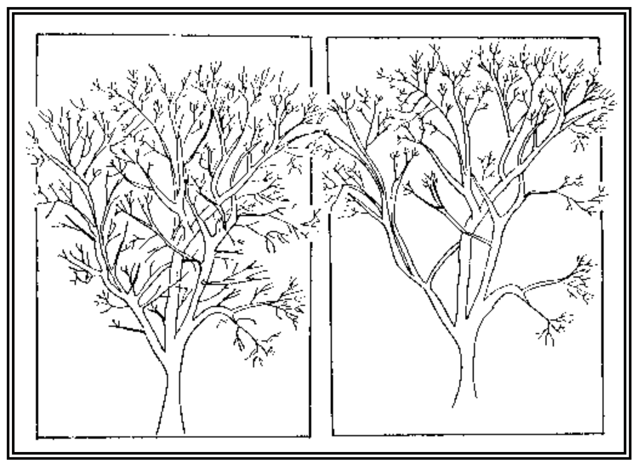

Figure 5. Tree pruning to reduce attractiveness to birds.

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

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

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

Habitat management does have the potential to have an effect on all T&E species if present in an area, especially where a T&E species is present that uses the habitat to be modified. If KWSP 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, KWSP will ensure that the cooperator is aware for the need to address T&E species impacts. Habitat management instigated by KWSP will only be conducted following a consultation with USFWS on a site-specific basis where T&E species are present. Any efforts to mitigate identified effects will be the responsibility of the landowner, but must be agreed upon before KWSP will commence WDM activities. This will ensure that KWSP habitat management activities will not have an adverse impact on T&E species and their habitat.

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

Physical Exclusion

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

Fencing. Fences are widely used to prevent damage from wildlife. Exclusionary fences constructed of woven wire or multiple strands of electrified wire can be effective in keeping wading birds from some areas such as an aquaculture facility or molting Canada Geese out of crop fields. The size of the wire grid must be small enough and the height of the fence high enough to keep the birds from entering the effected area. For ponds, fencing at least 3 feet high should be erected in water 2 to 3 feet deep. If fences are built in shallow water, birds can easily feed on the pond side of the fence. Raceway fences should be high enough to prevent feeding from the wall. Occasionally, blackbirds will cling to fencing or screening near the water and feed on small fish. A slippery surface created by draping plastic over the fence or screen can be used to eliminate this problem. Electric fences or wires have also been used with limited success. This type of exclusion can make routine work around ponds and hatcheries difficult or impossible. However, fencing does have limitations. Even an electrified fence is not always bird-proof and the expense of the fencing can often exceed the benefit. In addition, if large areas are fenced, the wildlife being excluded has to be removed from the enclosed area to make it useful.

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

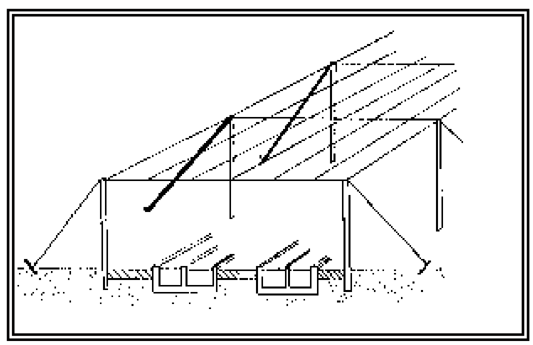

Figure 6. Overhead wire grid to exclude birds.

Netting consists of placing plastic or wire nets around or over resources in a small area, likely to be damaged or that have a high value. Netting is typically used to protect areas such as livestock pens, fish ponds and raceways, and high value crops. Complete enclosure of ponds and raceways to exclude all fish-eating birds requires 1.5- to 2-inch mesh netting secured to frames or supported by overhead wires (Figure 6). Gates and other openings must also be covered. Some hatchery operators use mesh panels placed directly on raceways to effectively exclude predatory birds. Small mesh netting or wire with less than 1-inch openings, secured to wood or pipe frames, prevents feeding through the panels. Because the panels may interfere with feeding, cleaning, or harvesting, they are most appropriate for seasonal or temporary protection. It is also used to prevent wildlife access to settling ponds that contain poisons which could kill them. Small mesh can also be used in ponds to prevent fish from entering shallow water where they would be easy prey for wading birds. Complete enclosure of areas with netting can be very effective at reducing damage by excluding all problem species, but can be costly.

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

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

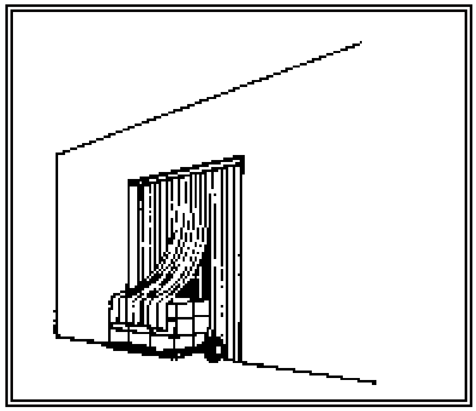

Figure 7. Entrance barricade to deter birds.

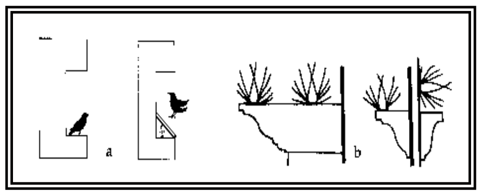

Figure 8. Porcupine wire on ledge to deter birds.

Wildlife Management

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

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

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

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

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

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

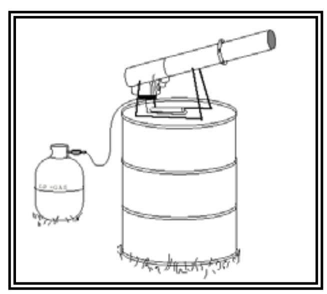

Figure 9. Propane exploder.

Pyrotechnics, shell-crackers and scare cartridges, are commonly used to repel wildlife. Shell-crackers are 12-gauge shotgun shells containing firecrackers that are projected up to 75 yards in the air before exploding. They can be used to frighten birds or mammals but are most often used to prevent crop depredation by birds or to discourage birds from undesirable roost locations. The shells should be fired so they explode in front of, or underneath, flocks of birds attempting to enter crop fields or roosts, or the air operating area at an airport. The purpose is to produce an explosion between the birds and their objective. Birds already in a crop field can be frightened from the field; however, it is extremely difficult to disperse birds that have already settled in a roost.

Noise bombs, whistle bombs, racket bombs, and rocket bombs are fired from 15 millimeter flare pistols. They are used similarly to shell-crackers but are projected for shorter distances. Noise bombs (also called bird bombs) are firecrackers that travel about 75 feet before exploding. Whistle bombs are similar to noise bombs, but whistle in flight but do not explode. They produce a noticeable response because of the trail of smoke and fire, as well as the whistling sound. Racket bombs make a screaming noise in flight and do not explode. Rocket bombs are similar to noise bombs but may travel up to 150 yards before exploding.

A variety of other pyrotechnic devices, including firecrackers, rockets, and Roman candles, are used for dispersing wildlife. Firecrackers can be inserted in slow-burning fuse ropes to control the timing of each explosion. The interval between explosions is determined by the rate at which the rope burns and the spacing between firecrackers.

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

Lasers are a relatively new technique used to frighten and disperse birds from their roosts. Although the use of a laser (the term of "laser" is an acronym for Light Amplification by 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 birds that consume the bait mostly 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, and emits distress calls, and then 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, KWSP would consult with the USFWS or KDWP to coordinate capture, transportation, and selection of suitable relocation sites.

Chemical Repellents. Chemical repellents are nonlethal chemical formulations used to discourage or disrupt particular behaviors of wildlife. There are three main types of chemical repellents: olfactory, taste, and tactile. Olfactory repellents must be inhaled to be effective. These are normally liquids, gases or granules, and require application to areas or surfaces needing protecting. Taste repellents are compounds (i.e., liquids, dusts, granules) that are normally applied to trees, shrubs and other materials that are likely to be ingested or gnawed by the target species. Tactile repellents are normally thick, liquid-based substances which are applied to areas or surfaces to discourage travel of wildlife by irritating the feet or making the area undesirable for travel. Most repellents are ineffective or are short-lived in reducing or eliminating damage caused by wildlife, therefore, are not used very often by KWSP.

Chemical repellents, as used by KWSP, 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 polybutenes (i.e., Tanglefoot®). These compounds are relatively nontoxic to the environment with the amount of active ingredient used in the different formulations, especially following label instructions. Many of the active ingredients in repellents are listed on the EPA's 25b exempt list, and have reduced registration requirements because of their relatively low risk to the environment. Most of the above repellents have labels with, at most, a "Caution" statement and can be purchased by the public. An exception is methiocarb which is discussed below. Applied in accordance with label directions, none of the other repellents discussed are expected to have an effect on nontarget species.

Methyl anthranilate (artificial grape flavoring used in foods and soft drinks for human consumption) could be used or recommended by KWSP 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 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 be in need of special protection. Mesurol® is registered for WS use only. The active ingredient is methiocarb which is a carbamate pesticide which acts as a cholinesterase inhibitor. Species which feed upon treated eggs may show signs of toxicity (e.g., regurgitation, lethargy, or temporary immobilization). Occasionally, birds may die after feeding upon treated eggs, but most birds exposed to treated eggs survive. Avery et al. (1995) examined the potential of using eggs injected with 30mg of methiocarb to condition common ravens from preying on eggs of endangered California least terns. Results showed that proper deployment of treated eggs can be a useful, nonlethal method for reducing raven predation at least tern colonies. Avery and Decker (1994) evaluated whether predation might be reduced through food avoidance learning. They used captive fish crows to examine avoidance response from methiocarb (18mg/egg) and methyl anthranilate (100mg/egg). Their study showed that some crows displayed persistence to the 5-day exposure and that successful application may require an extended period of training for target predators to acquire an avoidance response. During the spring of 2001, WS conducted a field test on the Sterling Wildlife Management Area in Bingham County, Idaho, where Mesurol® treated eggs were exposed to black-billed magpies to evaluate aversive conditioning to eggs of waterfowl and upland game birds. The number of magpies feeding on treated eggs decreased after a period. However, their feeding behavior switched to pecking holes in eggs, possibly trying to detect treated eggs before consuming them.

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[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.

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.

Leghold traps are versatile and widely used by KWSP for capturing many species. These traps can be utilized to live-capture a variety of animals but are most often used by KWSP to capture mammals. Birds are rarely targeted with leg-hold traps, except padded jaw leg-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 leg-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. KWSP 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 1997) had no concerns with impacts to T&E species from the use of these traps.

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

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

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

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

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

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

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

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

Drive traps are used to herd some animals into pens where they are captured and these are known as drive traps. Drive traps have been used for species such as Canada Geese, domestic waterfowl, jackrabbits (*Lepus* spp.), and ungulates. A drive-trap consists typically of wire panels that are erected into a 4 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 10) are modified No. 0 or 1 coil spring leg-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.

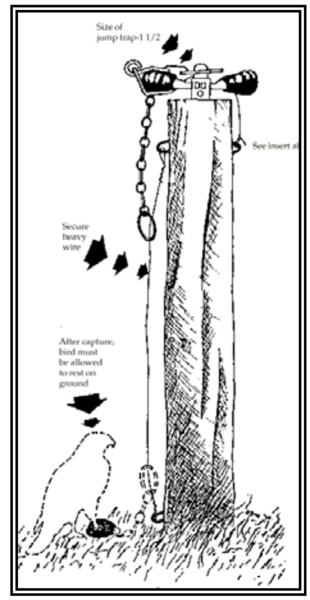

Figure 10. Padded-jaw pole trap.

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.

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. KWSP personnel do use lead based ammunition in rifles and sometimes shotguns. KWSP 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, KWSP often uses steel or other non-toxic shot as necessary to minimize the risk of lead poisoning to scavengers. The USFWS did not identify this as a concern in their BO (USDA 1997) which covered potential adverse effects on Bald Eagles from all WS used WDM methods, including shooting.

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

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

Some species frequently attack people to guard their nests. In Kansas, species that will actually hit people are Canada Geese and Mississippi Kites. This causes concern when the nest is located near a door or exit to a residential house or business. Of greatest concern is the threat to elderly people or bicyclist who may fall in response to the attack. Where these are creating a significant nuisance, KWSP 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, KWSP 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. KWSP 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. A-C is an immobilizing agent used by KWSP to capture and remove waterfowl, coots, pigeons, and gulls. These are typically used in urban, recreational, and residential areas where the safe removal of a problem animal is most easily accomplished with a drug delivery system, hand-fed baits. Immobilization is usually followed by relocation when appropriate (i.e., mainly waterfowl) or euthanasia. 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 KWSP does hold. A-C is currently regulated by FDA.

Alpha-chloralose is an immobilizing agent used to capture and remove nuisance birds. The drug is currently approved for use by WS as an FDA Investigational New Animal Drug (Registration #6602) rather than a pesticide. KWSP has used A-C for Canada Geese and American Crows in the last 5 FYs (FY02 - FY06), but could use it for a few other species. It has been typically used in industrial and residential areas. Single bread or corn baits are fed directly to target birds and those treated are monitored until the drug takes effect. KWSP personnel remain at the application site until all the immobilized birds are retrieved. Unconsumed baits are removed from the site following each treatment. A-C may be used only by KWSP personnel who have been trained and certified in its use. Pursuant to FDA restrictions, pigeons and waterfowl (during the hunting season) captured with A-C for subsequent euthanasia must be killed and buried or incinerated, or be held in captivity for at least 30 days, at which time the birds may be killed and processed for human consumption. Use of this drug is labor intensive and, therefore, not always cost effective (Wright 1973, Feare et al. 1981). A-C is typically delivered in small quantities contained in baits with minimal hazards to pets and humans because the single bread or corn baits are fed directly to the target birds. A-C was eliminated from more detailed analysis in USDA (1997) based on critical element screening, therefore, environmental fate properties of this compound were not rigorously assessed. However, the solubility and mobility are believed to be moderate and environmental persistence is believed to be low. Bioaccumulation in plants and animal tissue is believed to be low. A-C is used in other countries as an avian and mammalian toxicant. The compound is slowly metabolized, with recovery occurring a few hours after administration (Schafer 1991). The dose used for immobilization is designed to be about 2 to 30 times lower than the LD_{50}. LD_{50} values are typically much higher for mammals than birds. Toxicity to aquatic organisms is unknown (Wornecki et al. 1990), but the compound is not generally soluble in water and, therefore, probably remains unavailable to aquatic organisms. Since A-C is monitored at the application site, fed directly to target species, and uneaten baits are retrieved, the potential effect to nontarget species is low. Factors supporting the determination of this low potential impact included the lack of exposure to pets, non-target species and the public, and the low toxicity of the active ingredient. In addition, most A-C projects are conducted in urban-type environments. Other supporting rationale for this determination included relatively low total annual use by KWSP and a limited number of potential exposure pathways. However, because A-C is given in baits that the target species could drop or in a free-feeding condition, rather than injected into the animal, a nontarget species could be exposed to its sedative affects.

Euthanasia can be accomplished with several methods. Several drugs and methods are available to euthanize captured animals. Euthanasia methods include registered drugs such as Beuthanasia-D®, Fatal Plus®, cervical dislocation, decapitation, a shot to the brain, or asphyxiation with CO or CO_2. These methods are completely species specific and animals euthanized with drugs are buried or incinerated.

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

DRC-1339 (EPA. Reg. Nos. 56228-10, 56228-17, 56228-28, 56228-29, and 56228-30), 3-chloro-4-methylbenenamine hydrochloride, is an avian pesticide registered with EPA. For more than 30 years, DRC-1339 has proven to be an effective method of starling, blackbird, gull, crow, raven, magpie, and pigeon damage management (West et al. 1967, West and Besser 1976, Besser et al. 1967, and DeCino et al. 1966). DRC-1339 is a slow acting avicide that is rapidly metabolized into nontoxic metabolites and excreted after ingestion. This chemical is one of the most extensively studied and evaluated pesticides ever developed. Because of its rapid metabolism, DRC-1339 poses little risk of secondary poisoning to non-target animals, including avian scavengers (Cunningham et al. 1979, Schafer 1984, Knittle et al. 1990). This compound is also unique because of its relatively high toxicity to most pest birds but low-to-moderate toxicity to most raptors and almost no toxicity to mammals (DeCino et al. 1966, Palmore 1978, Schafer 1981). For example, starlings, a highly sensitive species, require a dose of only 0.3 mg/ bird to cause death (Royall et al. 1967); many other bird species such as raptors, House Sparrows, and eagles are classified as non-sensitive (USDA 1997). Numerous studies show that DRC-1339 poses minimal risk of primary poisoning to non-target and T&E species (USDA 1997). Secondary poisoning has not been observed with DRC-1339 treated baits. During research studies, carcasses of birds which died from DRC-1339 were fed to raptors and scavenger mammals for 30 to 200 days with no symptoms of secondary poisoning observed (Cunningham et al. 1979). This can be attributed to relatively low toxicity to species that might scavenge on birds killed by DRC-1339 and its tendency to be almost completely metabolized in target birds leaving little residue for scavengers to ingest. Secondary hazards of DRC-1339 are almost non-existent. DRC-1339 acts in a humane manner producing a quiet, painless death. Prior to the application of DRC-1339, pre-baiting is required to monitor for non-target species that may consume any bait. If non-target species are observed, then the use of DRC-1339 would be postponed or not applied. Research studies and field observations suggest that DRC-1339 treatments kill about 75% of the blackbirds and starlings at treated feedlots (Besser et al. 1967). Mitigation measures to avoid negative impacts to T&E species as well as the inherent safety features of DRC-1339 that preclude hazards to most species other than the target species listed above.

DRC-1339 is unstable in the environment and degrades rapidly when exposed to sunlight, heat, or ultra violet radiation. DRC-1339 is highly soluble in water but does not hydrolyze and degradation occurs rapidly in water. DRC-1339 tightly binds to soil and has low mobility. The half life is about 25 hours, which means it is nearly 100% broken down within a week, and identified metabolites (i.e., degradation chemicals) have low toxicity. Aquatic and invertebrate toxicity is low (USDA 1997). USDA (1997, Appendix P) contains a thorough risk assessment of DRC-1339 and that assessment concluded that no adverse effects to T&E species are expected from use of DRC-1339.

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

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

Avitrol®, 4-Aminopyridine, is often used as a chemical frightening agent (repellent) for blackbirds and starlings (mixed at a 1:99 ratio with untreated bait material, i.e., cracked corn), but it can be used as a toxicant at 1:9 ratio for pigeons, house sparrows, and other commensal birds. Avitrol® treated bait is placed in an area where the targeted birds are feeding and birds that consume treated baits normally die (Johnson and Glahn 1994). Birds display abnormal flying behavior after ingesting treated baits and emit distress vocalization (pigeons do not). This chemical is not normally used at airports because the abnormal flying behavior could cause affected birds to fly into the path of aircraft. Avitrol® is a restricted use pesticide that can only be sold to certified applicators and is available in several bait formulations where only a small portion of the individual grains carry the chemical. Any granivorous bird associated with the target species could be affected by Avitrol® which none of the T&E species in the United States are. Blackbirds and corvids are slightly more sensitive to the chemical than other species of mammals and birds. In addition, chronic toxicity has not been demonstrated (Schafer 1991). Laboratory studies with predator and scavenger species have shown minimal potential for secondary poisoning. However, in a field study, magpies and crows may have been affected secondarily (Schafer 1991). A laboratory study showed, though, that magpies which fed for 20 days on birds killed with 2 to 3.2 times the lethal dose of active ingredient were not affected (Schafer et al. 1974). Similarly, American kestrels that fed on blackbirds for 7 to 45 days which had died from a lethal dose of Avitrol® were not adversely affected (Schafer 1991). Therefore, no probable secondary risk is expected with use of this compound, even for pets and the public. Avitrol® is water soluble, but laboratory studies demonstrated that Avitrol® is strongly absorbed onto soil colloids and has moderately low mobility. Biodegradation is expected to be slow in soil and water, with a half-life ranging from 3 to 22 months. Avitrol® may form covalent bonds with humic materials, which may serve to reduce its bioavailability in aqueous media. Avitrol® is non-accumulative in tissues and rapidly metabolized by many species (Schafer 1991). KWSP has used Avitrol® in the last 5 FYs (FY02 - FY06), but has used it for urban bird damage situations. Use of Avitrol® by KWSP is not likely to have an adverse affect on T&E species, especially because it will be used according to label restrictions and primarily in urban environments by KWSP.

Chemosterilants and Contraception. Contraceptive measures can be grouped into four categories: surgical sterilization, oral contraception, hormone implantation, and immunocontraception (i.e., the use of contraceptive vaccines). These techniques would require that each individual animal receive either single, multiple, or possibly daily treatment to successfully prevent conception. The use of oral contraception, hormone implantation, or immunocontraception is subject to approval by Federal and State regulatory agencies. Surgical sterilization and hormone implantation are generally impractical because it requires that each animal be captured, sterilization conducted by licensed veterinarians, and, thus, would be extremely labor intensive and expensive. As alternative methods of delivering sterilants are developed, sterilization may prove to be a more practical tool in some circumstances (DeLiberto et al. 1998). Reduction of local populations could conceivably be achieved through natural mortality combined with reduced fecundity. No animals would necessarily be killed directly with this sterilization, however, and sterilized animals could continue to cause damage. Thus, sometimes culling the population to the desired level and then implementing a sterilization program would be the optimal solution to overabundant bird populations. Populations of dispersing animals would probably be unaffected. Potential environmental concerns with chemical sterilization would still need to be addressed, including safety of genetically engineered vaccines to humans and other wildlife. Several formulations of drugs have been and are being tested by NWRC and other researchers including nicarbazin, diazacon, and immunocontraceptives. These would have to be registered for use in Kansas before KWSP would use them. The only EPA approved contraceptive available is OvoControl™ G for Canada Geese in urban areas (population greater than 50,000) and FAA certificated airport environments. The active ingredient in OvoControl™ G is nicarbazin which was developed by WS NWRC researchers (WS 2004). Nicarbazin, a drug approved by FDA for use to control coccidiosis in chickens for the last 45 years, reduces the hatchability of eggs. This reduction only occurs while the bait is being consumed and, thus, primary and secondary hazards to other bird species and mammals are minimized or nullified. Following label directions further minimizes nontarget hazards. In Kansas, the use of this bait would have no effect on T&E or sensitive species, people, pets, or the environment. KWSP has not used OvoControl™ G, but could following registration with KDA. It is expected that this chemical would have minimal effect on the resident Canada Goose population in Kansas in the short-term because geese are long-lived. However, combined with culling, it would be effective at keeping local populations at manageable numbers.

3.3.2 Alternative 2 - Nonlethal BDM by KWSP Only

This alternative would require that KWSP use only nonlethal methods in addressing bird damage problems. For lethal BDM activities, producers, state agency personnel, or others could conduct BDM activities including the use of trapping, shooting, avicides, and any other lethal method. The basis of method selection may not be biologically sound or prudent. The chemical DRC- 1339 is currently only available for use by WS employees. Therefore, the use of this chemical by private individuals would be not be available. The only avian toxicants registered would be Avitrol® and Starlicide Complete which would not be the optimal choice in all bird damage situations.

3.3.3 Alternative 3 - KWSP Provides Technical Assistance Only for BDM

Under this alternative, KWSP would only provide technical assistance and make recommendations when requested to resolve bird damage problems. This alternative would not allow KWSP operational BDM. Producers, state agency personnel, or others could conduct BDM activities including the use of traps, shooting, avicides, and any lethal or nonlethal methods they wish. The chemicals DRC- 1339 and A_C are currently only available for use by KWSP employees. Therefore, these chemical could not be used by private individuals or State personnel. These chemicals may be the optimal choice to resolve a bird damage situation.

3.3.4 Alternative 4 - No Federal KWSP BDM

This alternative would consist of no federal involvement in BDM in the State -- neither direct operational management assistance nor technical assistance to provide information on nonlethal or lethal management techniques would be available from WS. Information on future developments in nonlethal and lethal management techniques that culminate from research efforts by WS' research branch would not be as accessible to affected resource owners or managers, as KWSP would not be a direct source of such information. Producers, state agency personnel, or others would be left with the option to conduct BDM activities including the use of trapping, shooting, and any lethal or nonlethal methods. The basis of method selection may not be biologically sound or prudent. The chemicals DRC-1339 and A-C are currently only available for use by WS employees. Therefore use of these chemicals by private individuals would be illegal, and private and commercial applicators would be left only with using an extremely narrow choice of legal or effective alternatives if chemical control was needed, (i.e. Avitrol®, etc.).

3.4 ALTERNATIVES CONSIDERED BUT NOT ANALYZED IN DETAIL WITH RATIONALE

Several alternatives were considered but not analyzed in detail. The prior EA (WS 2001) discussed several alternatives that were not discussed in detail and the discussion in this EA would be the same. The reader is referred to WS (2001) for a detailed discussion of these issues, but these will only be given here.

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

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

3.4.1 Lethal BDM Only By WS

Under this alternative, KWSP 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, KWSP has used nonlethal methods exclusively as an effective means to resolving damage. Lethal BDM Only does not interface with the overall concept of IWDM, where multiple methods can achieve a desired cumulative effect. Restricting that portion of the program to lethal methods only would likely not be socially acceptable to various agencies, groups and individuals.

3.4.2 Relocation Rather Than Killing Problem Wildlife

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

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

Relocation of problem wildlife might be a viable solution and acceptable to the public with wildlife that is considered to be of high value such as T&E or sensitive species.

3.4.3 Biological Control

The introduction of a species or disease to control another species has occurred throughout the world. Unfortunately, many of the introduced species become pests themselves. For example, in Hawaii, the Indian mongoose (*Herpestes auropunctatus*) was brought in to control rats (*Rattus* spp.), but wound up causing declines in many native Hawaiian bird species. Though many people think that this is a good idea for small flocking birds, KWSP dismissed it from further consideration because technology has not advanced to the point that biological control, even for non-native species such as the starling, is feasible and safe.

3.5 KWSP SOPs INCORPORATED INTO BDM TECHNIQUES

An SOP is any aspect of an action that serves to prevent, reduce, or compensate for negative impacts that otherwise might result from that action. The current program, nationwide and in Kansas, uses many such SOPs. Many WS SOPs are discussed in depth in USDA (1997, Chapt. 5). The key SOPs are incorporated into all alternatives as applicable, except the no federal program alternative (Alternative 2). Most SOPs are instituted to abate specific issues while some are more general and relate to the overall program. SOPs 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 KWSP's cooperating agencies (USFWS and KDWP) are included in the lists below.

3.5.1 General SOPs Used by KWSP in BDM

- KWSP BDM activities in Kansas are consistent with USDA (1997) SOPs.

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

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

- KWSP 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.

- KWSP 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. KWSP personnel abide by these. These restrictions invariably preclude or reduce exposure to nontarget species, the public, pets, and the environment.

- The WS Decision Model (Slate et al. 1992) thought process as discussed in Section 1.6.4 which is designed to identify effective WDM and their impacts, is consistently used.

3.5.2 KWSP SOPs Specific to the Issues

The following is a summary of the SOPs used by KWSP that are specific to the issues listed in Chapter 2 of this document.

3.5.2.1 Effects 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.

- KWSP Specialists use specific trap types, lures, and placements that are most conducive for capturing the target animal.

- KWSP BDM kill is monitored. Both "Total Harvest" and estimated population numbers of key species are used to assess cumulative effects of harvest. KWSP BDM is designed to maintain the level of harvest below that which would impact the viability of populations of native species (see Chapter 4). KWSP provides data on total take of target animal numbers to other agencies (i.e., USFWS, KDWP) as appropriate.

- KWSP currently has agreements for BDM on less than 1% of the land area in Kansas. This could be increased several-fold, but target bird take would be monitored to ensure that harvest remains below a level that would impact viability of a species. However, KWSP will not impact bird species populations on more than 90% of the lands in Kansas.

3.5.2.2 Effects on Nontarget Species Populations, Including T&E Species.

- KWSP personnel are highly experienced and trained to select the most appropriate BDM method(s) for taking problem birds with little impact on nontarget species.

- KWSP 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 KWSP Specialists 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, KWSP personnel will know how to identify the target and T&E species (e.g. Turkey Vulture vs. juvenile Bald Eagle), and apply BDM methods accordingly.

- Avian predators of T&E or sensitive species such as the Lesser Prairie-Chicken (a candidate species) could be captured, moved, or euthanized to enhance recruitment of the sensitive species. These actions would be conducted where they would provide a positive benefit to sensitive species with no significant negative impacts to target or nontarget populations.

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

  Bald Eagle. Even though the Bald Eagle was delisted in 2007 (remains on the Kansas T&E list), KWSP continues to implement all reasonable and prudent alternatives and measures and their terms and conditions to protect Bald Eagles as identified by USFWS in their 1992 BO (USDA 1997, Appendix F). Most of these were directed toward other facets of WDM and not BDM.

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

3.5.2.3 Impacts on Public Safety, Pets, and the Environment.

- A formal risk assessment (USDA 1997, Appendix P and Q) concluded that hazards to the public from BDM devices and activities are low.

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

- KWSP Specialists who use restricted use chemicals (i.e., pesticides or drugs) are trained and certified by program personnel or other experts in the safe and effective use of these materials under EPA and KDA approved programs. KWSP employees who use chemicals participate in continuing education programs to keep abreast of developments and to maintain their certifications.

- KWSP Specialists who use firearms and pyrotechnics are trained and certified by experts in the safe and effective use of these materials.

- 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.

3.5.2.4 Effects of BDM on Aesthetics

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

- KWSP could conduct BDM projects that protect T&E and sensitive species which could offer the public the potential opportunity to view these rarer species.

- KWSP 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.

3.5.2.5 Humaneness of Methods Used by WS

- Chemical immobilization and euthanasia procedures that do not cause pain or undue stress are used by certified KWSP personnel when practical and where safe.

- KWSP personnel attempt to kill captured target animals that are slated for lethal removal as quickly and humanely as possible. In most field situations, cervical dislocation is performed which causes rapid unconsciousness followed by cessation of heart function and respiration which is in concert with the American Veterinary Medical Association's (1987) definition of euthanasia (Beaver et al. 2001). In some situations, accepted chemical immobilization and euthanasia methods are used.

- Cage and padded-jaw leghold traps are set and inspected according to WS policy. Water and food are replenished as necessary in decoy traps.

- Research continues with the goal of improving the humaneness of BDM devices.

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 real or potential impacts would be greater, lesser, or the same. Therefore, the proposed action or current program alternative serves as the baseline for the analysis and the comparison of expected impacts among the alternatives. The background and baseline information presented in the analysis of the current program alternative thus also applies to the analysis of each of the other alternatives

4.1 ISSUES ANALYZED IN DETAIL

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

4.1.1 Effects of BDM on Target Bird Species Populations

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

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

4.1.1.1 Alternative 1 - Continue the Current Federal BDM Program. Under the current program alternative, take by KWSP and others will be considered Statewide providing a more comprehensive picture of impacts to bird populations. The prior EA (WS 2001) determined that BDM had no significant impacts to starling, blackbird, feral pigeon, and House Sparrow populations in Kansas. This EA has been expanded to include all bird species in Kansas to determine the magnitude of impacts for other species as well. Analyzing impacts of bird species at the statewide and Central Flyway area provides a more comprehensive and statistically sound look at cumulative impacts because population estimates and take is statistically more credible on a statewide or regional scale, and impacts are often to a regional population because most birds migrate.

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

A "viable" wildlife population can exist at many levels between one that is at carrying capacity (the maximum number of a species that a particular habitat can support) and one that is at only a fraction of carrying capacity. Because rates of increase are density dependent (i.e., the population grows at a faster rate as the population is reduced in relation to carrying capacity), bird populations have the ability to recover from declines that might result from mistakes in management. History has 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 Kansas, even if a sustainable harvest rate is exceeded in the short term in areas where the objective is to maintain the population.

The methods used by KWSP 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 3.3.1.3 as well as the prior EA (WS 2001). 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 3.2. 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 KWSP personnel and incorporated by the resource owner.

KWSP 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 KWSP BDM; however, nonlethal BDM will be analyzed for potential impacts as well. The analysis for magnitude of impact generally follows the process described in USDA (1997, Chapt. 4). Magnitude is described in USDA (1997) as " . . . *a measure of the number of animals killed in relation to their abundance*." 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, KWSP only conducts most 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

KWSP conducted lethal BDM annually from FY02 to FY06 for 15 primary bird species in Kansas, but has the potential for dealing with many more species. KWSP took 36 species that caused damage, collected 9 species for disease monitoring only, and euthanized 1 species that was struck by a vehicle from FY02 to FY06 (Table 4). The species that cause damage are listed in Section 1.2 with general information about them and the agency, USFWS, KPDW, or KWSP, that has primary responsibility for responding to damage complaints involving them. The primary target species taken yearly in Kansas are introduced commensal species (European Starlings, feral pigeons, House Sparrows), Blackbirds (7 species as discussed), Canada Geese, Mallards, Cattle Egrets, Ring-billed Gulls, and Mourning Doves. Additionally, KWSP has taken 21 species, but only minimal numbers. Of the annual take of birds from FY02 to FY06, 99% of the take were 4 species: starlings (58%), Red-winged Blackbirds (33%), Brown-headed Cowbirds (4%), and Common Grackles (4%). The remaining 42 species accounted for about 1% of KWSP's lethal take.

Table 4. Birds killed by KWSP in BDM from FY02 to FY06. Take was estimated for species killed with toxicants.

Species	FY02	FY03	FY04	FY05	FY06	Ave
Introduced Commensal Birds						
European Starling*	303,381	1,506,628	859,164	519,627	686,684	775,097
Feral (Rock) Pigeon*	2,365	1,873	995	2,058	3,168	2,092
House Sparrow*	-	3,404	10,209	2,225	1,561	3,480
Blackbirds						
Red-winged Blackbird*	39,439	93,894	20,727	27,508	25,527	41,419
Brown-headed Cowbird*	3,573	5,936	1,912	1,954	102,226	23,120
Common Grackle*	813	3,070	982	1,012	1,912	1,558
Great-tailed Grackle*	62	160	52	48	77	80
Yellow-headed Blackbird*	36	138	45	46	89	71
Brewer's Blackbird*	41	90	19	26	18	39
Rusty Blackbird*	6	10	1	3	0	4
Waterfowl						
Canada Goose	4	29	145	33 (1)	24	47
Mallard	19	72	19	6	27	29
Northern Pintail[D]	-	-	-	-	1	0
Gadwall	-	2	-	-	1	1
Northern Shoveler	-	-	-	2	5	1
Blue-winged Teal	3	-	3	2	7	3
Wood Duck	2	-	-	-	-	0
Wading Birds						
Cattle Egret	37	56	47	-	28	34
Snowy Egret	2	-	1	-	-	1
Great Egret	1	2	-	-	-	1
Great Blue Heron	1	-	-	-	-	0
Little Blue Heron	1	-	-	-	-	0
Gulls						
Ring-billed Gull	-	35	6	14	15	14
Franklin's Gull	-	29	-	3	2	7
Bonaparte's Gull	-	-	-	4	9	3
Raptors						
Red-tailed Hawk	-	-	1	1	-	0
Barred Owl[I]	-	-	1	-	-	0
Shorebirds						
Killdeer	3	2	2	3	1	2
Upland Sandpiper	3	2	2	-	-	1
Semipalmated Plover[D]	-	-	-	-	1	0
Greater Yellowlegs[D]	-	-	-	-	1	0
Lesser Yellowlegs[D]	-	-	-	-	3	1
Spotted Sandpiper[D]	-	-	-	-	2	0
Semipalmated Sandpiper[D]	-	-	-	-	1	0
Baird's Sandpiper[D]	-	-	-	-	1	0
Pectoral Sandpiper[D]	-	-	-	-	5	1
Long-billed Dowitcher[D]	-	-	-	-	14	3
Miscellaneous Birds						
Mourning Dove	70	50	7	11	14	30
Western Kingbird	4	-	-	-	-	1
American Crow	6	7	14	9	-	7
Cliff Swallow	4	-	-	23	4	6
Barn Swallow	-	-	5	-	-	1
American Robin	9	-	-	- (2)	2	2
Eastern Meadowlark	3	-	-	-	-	1
Horned Lark	-	-	-	2	1	1
House Finch	-	-	-	-	4	1

*Take was estimated for blackbirds recorded as mixed blackbirds taken with lethal BDM methods, other than avicides discussed in Table 3, for winter (12/01 to 03/31) projects according to CBC data (NAS 2006), and for the remainder of the year by the average between BBS (Sauer et al. 2006) and CBC (NAS 2006) data.
** Estimated as above (*) for Nebraska and Texas, and by using 0.1% for Kansas and Oklahoma during migration.
[D] – Disease monitoring only – no damage per se
[I] – Compound fracture from collision with vehicle (would not have survived) – accidental damage per se (caused $50 damage to vehicle)
(#) – Nests removed

KWSP uses several BDM methods that result in the lethal take of birds. The greatest number of birds is lethally taken with chemical methods. KWSP used 4 chemicals on birds from FY02 to FY06, DRC-1339, Avitrol®, A-C, and Fatal Plus®. Table 3 (Section 2.1.3) gives the amount of chemical used by KWSP.

Take is recorded in the MIS for the use of A-C and Fatal Plus®. 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 KWSP 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 KWSP Specialists. The other blackbirds were divided to species by the typical composition of birds found in Kansas during the time of year the project took place. It should be noted that the take of Rusty Blackbirds, though minimal, is likely a high estimate because they mostly forage in wet woodlands away from other blackbirds.

KWSP (WS 2001) personnel estimated that the composition of blackbirds at CAFOs where DRC-1339 treated baits were placed was 95% starling, 4% to 5% Red-winged Blackbird, and a combined 0.1% to 1% for Brown-headed Cowbird, Brewer's Blackbird, Common Grackle, and Great-tailed Grackle. Monitoring reports completed after the EA (WS 2001) found that Starling numbers likely increased to 95% while Red-winged Blackbirds decreased from 30% to 5%. This was likely due to the loss of a large marsh area in the Cheyenne Bottoms in the Great Bend, Kansas area used by Red-winged Blackbirds. However, the take for mixed blackbird projects will be estimated by the species composition found in BBS and CBC data for each State in the Central Flyway where BDM is conducted by WS, including Kansas, for analysis purposes. It should be noted that one CBC count in Kansas, Quivira National Wildlife Refuge in Stafford County has disappeared, most likely taking up residence elsewhere in the State. It skewed the data of the blackbirds other than starlings to Red-winged Blackbirds from a winter roost present at that location in 2002-03 (12,500,000 Red-winged blackbirds estimated), 2004-05 (5,000,000), and 2005-06 (2,000,000), but has stabilized. KWSP has not conducted BDM for mixed blackbirds in Stafford County. However, these likely winter at new locations and still could be found at feedlots. 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 KWSP than estimated as discussed in Appendix B. Overall, it was estimated that starlings make up at least 95% of the flocks found at feedlots in Kansas.

For blackbirds other than starlings in mixed blackbird projects, species composition was estimated from April 1 to November 30 using the average of the BBS (Sauer et al. 2006) and CBC (NAS 2007) percentage composition combined) species composition for Kansas. For mixed blackbird projects from December 1 to March 31, an estimate of species composition was derived from CBC data (NAS 2007). It should be noted that few Yellow-headed Blackbirds were recorded in Kansas during bird surveys, and the estimated was actually zero. Most projects at CAFOs begin after Yellow-headed Blackbirds have migrated. However, Nebraska's species composition was used for the Great Plains states, since it is likely that some are present during baiting operations. KWSP Specialists see very few blackbirds other than starlings during BDM projects at CAFOs. These percentages are used to estimate take for the different species. The estimated take is added to other take to determine impacts to the species taken in BDM in

Table 4. It should be noted that the Red-winged Blackbird roost in a wetland adjacent to the primary area where KWSP conducts BDM at feedlots in winter was abandoned in 2002 because the wetland disappeared from several years of drought and a cattail management program conducted by the state. Take at the feedlots adjacent to the lost cattail marsh has become much more focused on starlings with fewer blackbirds being taken coinciding with KWSP Specialist observations. Researchers working in the area in 2006-07 captured only starlings and saw few other blackbirds in feedlots suggesting even a higher percentage of starlings as discussed in Appendix B.

KWSP conducted disease surveillance in FY06. The primary focus of the disease surveillance work was to monitor for the presence of H5N1 AI. KWSP collected 537 samples for testing, 250 from fecal droppings from birds monitored. KWSP collected bird samples by shooting (~40) or taking samples from species killed during BDM projects (~100); these were included in Table 4. For the disease surveillance effort, KWSP also captured with mist nets, sampled, and released 147 shorebirds (Table 16): 1 Long-billed Dowitcher, 2 Semipalmated Plovers, 1 Buff-breasted Sandpiper, 31 Least Sandpiper, 20 Pectoral Sandpipers, 60 Semipalmated Sandpipers, 1 Spotted Sandpiper, 22 Western Sandpipers, 3 Greater Yellowlegs, and 6 Lesser Yellowlegs.

Introduced Commensal Bird Population Impacts

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

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. BBS data have shown a nonsignificant (*Probability (P)*=0.20) decreasing population trend of -1.3%/year from 1980 to 2005 (Sauer et al. 2006). BBS data (2001-2005) indicate a large population in Kansas. However, it must be noted that large numbers of starlings are located in urban areas and BBS routes often do not account for these populations because most BBS routes are run in areas that are more rural. Thus, BBS data are more likely to reflect the number of starlings in rural areas and not include the urban populations which would likely be the higher number. The breeding starling population in Kansas could be estimated from BBS data (Sauer et al. 2006) using corrective parameters (Rich et al. 2004) at 2.6 million, but is likely higher because BBS routes are most often conducted away from urban centers and, therefore, urban populations are missed.

Even so, with a population of 2.6 million breeding starlings, the population would increase following the nesting season. Not all starlings may breed their first year, but it was estimated that at least 66% of females did. In many populations of starlings, the males outnumber the females 2:1. Starlings lay an average of 4-6 eggs with the average being 4.28 in the Midwest and have two clutches each year below 48° latitude (Cabe 1993). Fledgling success was found to average 76.1% in New York (higher in Ontario) for both clutches with the first being about 10% more successful (Cabe 1993). Using these parameters, a breeding population of 2.6 million in Kansas would have about 575,000 breeding females that fledge 3.77 million starlings, raising the post-fledgling population to about 6.41 million starlings in Kansas. Additionally, during winter months, when the majority of BDM projects are conducted, an influx of starlings is seen in Kansas with birds migrating into the State from northern areas (band return data reflect these movements). Some starlings may leave the state, but it is likely that Kansas actually has two or three times as many starlings coming into the state during winter from migration. However, not considering the migrant population, KWSP and others could potentially take about 3.7 million starlings annually without affecting the population, the borderline between moderate and high magnitude of take. KWSP has averaged the take of about 775,000 starlings annually from FY02 to FY06. KWSP and other agencies have no idea how many starlings are taken by private efforts to reduce damage by starlings because they are unprotected and private individuals and others can take them without a permit. Thus, resource owners suffering damage can take starlings with available BDM methods. KWSP believes that other individuals or agencies might possibly take up to 250,000 starlings in control projects in Kansas, primarily with shooting and Avitrol® and Starlicide Complete®, commercially available products for certified pesticide applicators. With this information, Table 5 provides a cumulative impact analysis of KWSP and other starling take in Kansas. FY03 had the highest estimated take at 27% of the post-breeding population, or 46% of the annual mortality. This would not be enough to cause the population to decline and would be a low magnitude of take. Take could about double before the magnitude of impact would rise to a high level for the currently estimated population.

Table 5. Cumulative impact analysis for European Starlings killed in Kansas by KWSP and others (estimated) from FY02 to FY06.

STARLING IMPACT ANALYSIS IN KANSAS						
	FY02	FY03	FY04	FY05	FY06	Ave.
Est. Breeding Pop.	2,600,000	2,600,000	2,600,000	2,600,000	2,600,000	2,600,000
Breeding Females (2/3 pop males)	575,000	575,000	575,000	575,000	575,000	575,000
Ave. Clutch	4.3	4.3	4.3	4.3	4.3	4.3
Ave. Nests	2	2	2	2	2	2
% Fledge	76%	76%	76%	76%	76%	76%
Young Produced/ Stable Pop. Ann. Mort.	3, 800,000	3,800,000	3,800,000	3, 800,000	3,800,000	3,800,000
Total Population	6,400,000	6,400,000	6,400,000	6,400,000	6,400,000	6,400,000
KWSP Take	303,381	1,506,628	859,164	519,627	686,684	775,097
Other Take	250,000	250,000	250,000	250,000	250,000	250,000
Total Take	553,381	1,756,628	1,109,164	769,627	936,684	1,025,097
% of Kansas Post-breeding Population	9%	27%	17%	12%	15%	16%
% of Ann. Mortality	15%	46%	29%	20%	25%	27%

KWSP Specialist 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 95% starlings, and 4%-5% red-winged with the remaining 1% comprised of common grackles, brown-headed cowbirds, great-tailed grackles, and Brewer's blackbirds. Even if the percentage of starlings taken in projects at feedlots with DRC-1339 were increased to 100% (which is possible given that few other blackbirds were found in the feedlots being treated), it would raise the estimated total take to 47% (0.6% increase) of their annual mortality in FY03 and about 0.2% of the 5 year average. This would still not be enough to cause the population to decline and would be a low magnitude of take. Therefore, KWSP has determined that KWSP has not added to a cumulative impact to the starling population. It should be noted that even with the high take of starlings in FY03, take in FY04 was still very high indicating that the population had not been impacted. Take between years by KWSP mostly reflects the availability of KWSP 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 KWSP program is considered to be of no significant impact on the human environment since starlings are not an indigenous component of ecosystems in Kansas. In fact, the removal of starlings could be beneficial for many native species such as the Eastern Bluebird that declined significantly earlier this century with the spread of European Starlings across the United States as discussed in Section 1.3.7.

Feral Pigeon. The feral domestic pigeon, also known as the Rock Pigeon, is an introduced (nonnative) species in North America not protected by federal or state law. BBS data indicate that the species has experienced a nonsignificant (P=0.71) increasing trend in Kansas from 1980 to 2005 at 1.3%/year (Sauer et al. 2006). The breeding feral pigeon population in Kansas could be estimated from BBS data (Sauer et al. 2006) 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.

Most pigeons breed their first year with available habitat. For the purposes of impacts, it is assumed that 75% of females breed in a given year and that the sex ratio is 1:1 males to females. Pigeons usually lay 2 eggs per nest, and average 6.5 clutches per year. Fledgling success was found to average 43% (Johnston 1992). Using these parameters, a breeding population of 305,000 in Kansas would have about 114,000 breeding females that fledge 635,000 pigeons, raising the post-fledgling population to about 940,000 feral pigeons in Kansas. It is believed that local pest control operators, private individuals, and hunters probably take about 200,000 pigeons annually (of the commensal species, the pigeon is probably taken more than any other because of the damage they cause). KWSP takes minimal numbers of pigeons averaging less than 2,100 annually from FY02 to FY06 (KWSP takes <1% of the expected annual mortality). With this information, Table 6 provides a cumulative impact analysis of KWSP and other feral pigeon take. FY06 had the greatest cumulative take with an estimated 22% of the post-breeding population taken in Kansas. This would be a low magnitude of impact on the population.

Any BDM involving lethal control actions by KWSP 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 FY02 to FY06 were minimal from KWSP BDM and cumulative impacts would have amounted to an estimated 32% of the annual mortality or 21% of the post-breeding population. This would not impact the feral pigeon population in Kansas because those pigeons removed would be replaced through recruitment. Take would have to be about 0.5 million before the level would rise to a moderate level of impact. Additionally, we believe that the pigeon population in Kansas is much greater than that analyzed.

Table 6. Cumulative impact analysis for feral pigeons killed in Kansas by KWSP and others (estimated) from FY02 to FY06.

FERAL PIGEON IMPACT ANALYSIS IN KANSAS						
	FY02	FY03	FY04	FY05	FY06	Ave.
Est. Breeding Pop.	305,000	305,000	305,000	305,000	305,000	305,000
Breeding Females	114,000	114,000	114,000	114,000	114,000	114,000
Ave. Clutch	2	2	2	2	2	2
Ave. Nests	6.5	6.5	6.5	6.5	6.5	6.5
% Fledge	43%	43%	43%	43%	43%	43%
Young Produced/ Stable Pop. Ann. Mort.	635,000	635,000	635,000	635,000	635,000	635,000
Total Population	940,000	940,000	940,000	940,000	940,000	940,000
KWSP Take	2,365	1,873	995	2,058	3,168	2,092
Other Take	200,000	200,000	200,000	200,000	200,000	200,000
Total Take	202,365	201,873	200,995	202,058	203,168	202,092
% of Kansas Post-breeding Population	22%	21%	21%	21%	22%	21%
% of Ann. Mortality	32%	32%	32%	32%	32%	32%

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 (P<0.01) decrease in Kansas from 1980 to 2005 at -5%/year (Sauer et al. 2006). This decrease is likely due to the replacement of horses with internal combustion engines (House Sparrows pick seed from horse manure), and reduced insects for feeding in urban areas and on farms from the use of insecticides, reduced grain from spillage because of more efficient harvesters, and reduced weed seeds from weed control (Lowther and Cink 2006). However, the breeding population in Kansas is still abundant. The breeding House Sparrow population in Kansas could be estimated from BBS data (Sauer et al. 2006) using corrective parameters (Rich et al. 2004) at 3 million. Most House Sparrows breed their first year with available habitat. For the purposes of impacts, it is assumed that 75% of females breed in a given year and that the sex ratio is 1:1 males to females. House Sparrows lay an average of 5.1 eggs per nest and average 1.6 clutches per year, with fledgling success averaging 40% (Lowther and Cink 2006). Using these parameters, the breeding population in Kansas would have about 3.7 million fledglings, raising the post-fledgling population to about 6.7 million in Kansas.

Table 7. Cumulative impact analysis for House Sparrows killed in Kansas by KWSP and others (estimated) from FY02 to FY06.

HOUSE SPARROW IMPACT ANALYSIS IN KANSAS						
	FY02	FY03	FY04	FY05	FY06	Ave.
Est. Breeding Pop.	3,000,000	3,000,000	3,000,000	3,000,000	3,000,000	3,000,000
Breeding Females	1,125,000	1,125,000	1,125,000	1,125,000	1,125,000	1,125,000
Ave. Clutch	5.1	5.1	5.1	5.1	5.1	5.1
Ave. Nests	1.6	1.6	1.6	1.6	1.6	1.6
% Fledge	40%	40%	40%	40%	40%	40%
Young Produced/ Stable Pop. Ann. Mort.	3,700,000	3,700,000	3,700,000	3,700,000	3,700,000	3,700,000
Total Population	6,700,000	6,700,000	6,700,000	6,700,000	6,700,000	6,700,000
KWSP Take	-	3,404	10,209	2,225	1,561	3,480
Other Take	50,000	50,000	50,000	50,000	50,000	50,000
Total Take	50,000	53,404	60,209	52,225	51,561	53,480
% of Kansas Breeding Population	1%	1%	1%	1%	1%	1%
% of Ann. Mortality	1%	1%	2%	1%	1%	1%

KWSP conducts minimal BDM for House Sparrows in Kansas, averaging the take of almost 3,500 annually (<1% of the expected annual mortality). Because House Sparrows are not afforded protection by federal or state laws, 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®. With this information, Table 7 provides a cumulative impact analysis of KWSP and other House Sparrow take in Kansas. The cumulative impact to the House Sparrow population is less than 1% of the population and up to 2% of their expected annual mortality. This would be a minor impact on the population and not enough to cause the population to decline. In fact, take would have to be in the millions in Kansas before an impact would likely start to occur. Habitat loss, primarily a decline in feeding sites and the availability of feed, over the last 60 years has been the most likely contributor to their decline (Lowther and Cink 2006).

Blackbird Population Impacts

Precise counts of blackbird populations do not exist but one estimate placed the United States summer population of the blackbird group, which includes starlings, at over 1 billion (USDA 1997) and the winter population at over 500 million (Meanley and Royal 1976, Royall 1977). The majority of these birds occur in the eastern U.S.; for example surveys in the southeastern part of the country estimated 350 million blackbirds and starlings in winter roosts (Bookhout and White 1981). The northwest and southwest regional population of the blackbird group was estimated at 111 million (Meanley and Royall 1976). An intensive study from 1996 to 1998 in the Northern Prairie-Pothole Region (Peer et al. 2003) including areas in North and South Dakota, Minnesota, Saskatchewan, and Alberta (Figure 11) found 61 million breeding Red-winged and Yellow-headed Blackbirds, and Common Grackles (Table 8). Data from BBS indicate that the blackbird population (including with the aforementioned species, Brown-headed Cowbirds, Great-tailed Grackles, and Rusty Blackbirds) survey-wide is about 400 million and in the Central Flyway BBS Physiographic Regions (area shaded in Figure 4) is 150 million. This EA will use the population estimated in each of the physiographic areas of the Central Flyway BBS Regions (Figure 4) used to make population estimates (Appendix A) in Table 1.

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

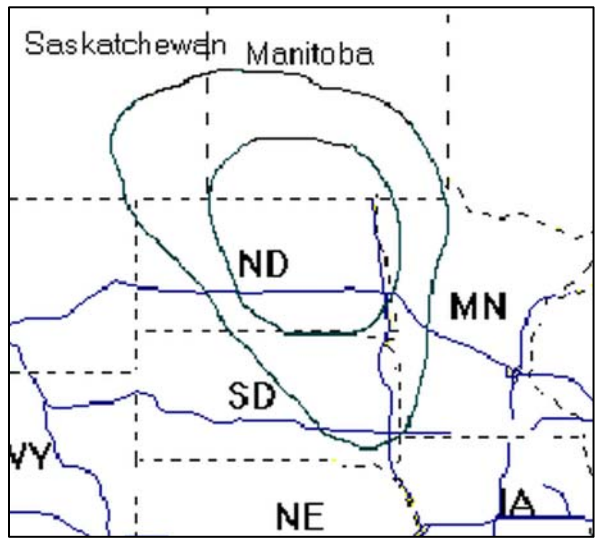

Figure 11. The Northern Prairie-Pothole region used by Peer et al. (2003) to make an estimate of the population of 3 blackbird species.

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

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

Based on observations of KWSP personnel at several affected Kansas feedlots where KWSP starling and blackbird damage management operations are concentrated, the species composition of the birds causing damage has recently been estimated to be about 95% starlings, and 4% to 5% Red-winged Blackbirds with the remaining 0.1% to 1%% comprised of 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. A CBC count (NAS 2007), Quivira National Wildlife Refuge in Stafford County, Kansas, skewed the percentages of Red-winged Blackbirds because a large roost was located in the cattail marshes and estimate of the number present (87% of the Red-winged Blackbirds in Kansas). The average count for Red-winged Blackbirds was 3.9 million of the 4.5 million seen in all counts in Kansas from 2001-02 to 2005-06 surveys. Thus, the species composition in Kansas reflects this. Additionally, the loss of the roost in Cheyenne Bottom decreased the number of Red-winged Blackbirds at nearby feedlots (blackbirds will travel up to 20 miles from a roost to feed) and composition at adjacent feedlots has shifted to almost entirely starlings. However, the WS Specialists estimation will be used to analyze impacts. In addition to looking at take based on 95% starlings and 5% other blackbirds, the percentage was doubled for feedlots (10% other blackbirds). This higher estimate is being used for blackbirds to ensure that take estimates are conservative for native species. Impacts to starling were considered above and included an impact analysis at the 95% estimate (95% starlings in blackbird flocks estimated by KWSP personnel that conduct BDM at CAFOs), but concluded low magnitude of impact to starlings even at that level.

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 2005 on BBS routes (Sauer et al. 2006). However, the survey-wide BBS data show a significant ($P<.01$) downward trend in the population of -0.9%/year. BBS data (Sauer et al. 2006) show the Red-winged Blackbird population has been slightly declining in Kansas and the Central BBS Region for the period 1966-2005, but these have not been significant ($P>.05$). 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).

Female Red-winged Blackbirds breed as yearlings (second year); males do not breed until their third year. For the sake of estimating the population for this EA, it is assumed that 75% of the Red-winged Blackbird females breed, the sex ratio is 1:1 males to females, females lay 3-5 eggs with the average of 3.3, and they have an average of 1.7 nests annually (Yasukawa and Searcy 1995). Fledgling success was found to range from 40% to 88% for the first clutch varying with climatic conditions; for the analysis of population impacts it will be assumed, to be conservative, that only 40% fledge. Far fewer nestlings were found to be successfully fledged from a second clutch, 4%, which will be used in this analysis (Yasukawa and Searcy 1995). Using these parameters, a breeding population of 52 million in the Central Flyway would have about 19.5 million breeding females that successfully fledge about 27.5 million nestlings, raising the post-fledgling population to about 80 million Red-winged Blackbirds. This would be an increase in the population by a factor of 1.54. Peer et al. (2003) used a factor of 1.45 to estimate the fall population (Table 8). Thus, about 6% of the population would die from fledging to fall, presumably mostly juveniles, which would be expected.

Natural mortality in blackbird populations is between 50% and 65% of the population each year, regardless of human-caused control operations (USDA 1997). Based on population modeling, Dolbeer (1998) showed that the effect of reducing survival of two blackbird species by 50% (additional loss following natural mortality prior to breeding) was only a 41% reduction in the population by the end of three years. For a population of 190 million Red-winged Blackbirds with an assumed average annual survival of 50%, cutting the survival in half would require the mortality of an additional 47 million per year over the natural mortality level. Assuming that human-induced mortality is mostly compensatory, instead of additive, to natural mortality, this level of impact is well within the extent of normal mortality levels and thus well within the ability of the population to withstand. To further illustrate the minor degree of impact, Sawin et al. (2003) found that the removal of all males over a large area that did not breed during a given year because they were unsuccessful in establishing a territory (floaters) did not have any effect on the population or the number of floaters the following year. This suggests that recruitment and immigration replaced those blackbirds lost to the population and the population remains stable for the available habitat.

KWSP conducts few BDM projects for Red-winged Blackbirds specifically, but mostly for starlings with some of them in mixed flocks. The take of Red-winged Blackbirds by KWSP was estimated to be about 41,500 annually from FY02 to FY06 with a high of almost 100,000 in FY03. The WS Program cumulatively in the Central Flyway takes an average of 350,000 Red-winged Blackbirds. Because the public is permitted to take Red-winged Blackbirds that are causing depredations or are a health nuisance under a depredation order by USFWS, depredation permits are not required to be obtained by private individuals or agencies to take them. The public conducts control of Red-winged Blackbirds to protect crops such as sunflower, corn, and wheat and livestock feed and health at CAFOs in the Central Flyway and much of this is done with trapping, shooting, and the use of Avitrol®. However, KWSP has no way of determining how many blackbirds are taken by private efforts. It is expected that this effort occurs, especially to protect crops such as sunflowers, but the numbers actually taken are probably minimal. However, for the purposes of this analysis, it is estimated that up to 2 million Red-winged Blackbirds would be taken by private efforts (this would be a significant number of blackbirds taken by private individuals using the available methods and believed to be an overestimate, to be conservative). With this information, Table 9 provides a cumulative impact analysis for Red-winged Blackbird take by KWSP, other WS Programs in the Central Flyway, and private individuals and entities in the Central Flyway, south of the BBS limits. The cumulative impact to the Red-winged Blackbird population from FY02 to FY06 averaged about 3% of the post-breeding population and up to 9% of their expected annual mortality. This would not be enough to cause the population to decline. Doubling the percentage of blackbirds other than starlings taken in DRC-1339 projects at feedlots did not appreciably elevate take percentages. In fact, take would have to be in the tens of millions before an impact would likely start to occur. Under the Proposed Action (Alternative 1), potentially up to a million Red-winged Blackbirds could be taken by KWSP. However, KWSP does not anticipate taking such a level, but if this occurred, it would not impact the population. Habitat loss, primarily a decline in breeding habitat, over the last 60 years has been the most likely contributor to their decline.

WS in the Central Flyway region has killed an average of about 350,000 Red-winged Blackbirds in BDM activities from FY02 to FY06 with a high of almost 0.5 million in FY03. This was about 3% of the natural annual mortality expected to occur. KWSP accounted for over 20% of the WS take in that year. Kansas, depending on the severity of the winter, can have a high percentage of the wintering blackbirds form northern regions. The estimated take of Red-winged Blackbirds in Kansas, and the Central Flyway, is expected to remain somewhat low because KWSP and other state WS programs that conduct BDM at CAFOs primarily target starlings rather than blackbirds because they frequent them often and cause more damage. Even so, take of Red-winged Blackbirds by KWSP and the WS Program in the Central Flyway is not anticipated to have more than a temporary minor effect on the population. Even if all of the DRC-1339 used by WS in the Central Flyway for "Mixed Blackbirds" targeted only Red-winged Blackbirds, WS's take would increase to 42% of the expected annual mortality and the cumulative impact to less than 50%. Thus, KWSP believes that it, as well as the WS program in the Central Flyway, has only had a relatively minor impact on the Red-winged Blackbird population and does not believe that even under the worst case scenario (all DRC-1339 and Avitrol® targeting mixed blackbird flocks taking only Red-winged Blackbirds), this would be elevated to a level of significance.

Table 9. Cumulative impact analysis for Red-winged Blackbirds killed in Kansas by KWSP, other WS Programs in the Central Flyway, and private individuals and entities (estimated) from FY02 to FY06.

RED-WINGED BLACKBIRD IMPACT ANALYSIS						
	FY02	FY03	FY04	FY05	FY06	Ave.
Est. Breeding Pop. In Central Flyway	52,000,000	52,000,000	52,000,000	52,000,000	52,000,000	52,000,000
% Breeding Females in Population	37.5%	37.5	37.5%	37.5%	37.5%	37.5%
Estimated Number Breeding Females	19,500,000	19,500,000	19,500,000	19,500,000	19,500,000	19,500,000
Ave. Clutch	3.3	3.3	3.3	3.3	3.3	3.3
Ave. Nests	1.7	1.7	1.7	1.7	1.7	1.7
% Fledge 1st Nest/2nd Nest	40%/4%	40%./4%	40%/4%	40%/4%	40%./4%	40%/4%
Young Produced/ Stable Pop. Ann. Mort.	27,500,000	27,500,000	27,500,000	27,500,000	27,500,000	27,500,000
Total Population	80,000,000	80,000,000	80,000,000	80,000,000	80,000,000	80,000,000
KWSP Take	39,439	93,894	20,727	27,508	25,527	41,419
Other WS Take in Central Flyway	444,476	371,740	251,160	411,904	273,641	350,584
WS Take % Central Flyway Ann. Mort.	2%	2%	1%	2%	1%	1%
Private Take in Central Flyway	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000
Total Take	2,483,915	2,465,634	2,271,887	2,439,412	2,299,168	2,392,003
% of Central Flyway Post-breeding Pop.	3%	3%	3%	3%	3%	3%
% of Ann. Mortality	9%	9%	9%	9%	9%	9%

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 1966 to 2005 and 1980 to 2005 show identical trend patterns for Brown-headed Cowbirds BBS survey-wide, in the Central BBS area, and in Kansas with mostly significant downward trends in the population of -1.1%/year, -0.8%/year, and -1.2 %/year (P<.01, except Kansas 1980-2005 P=.07), respectively. These declines are thought to have occurred because of habitat loss that has affected host species (being a parasitic nester – lays eggs in other bird species' nests). This is an abundant species in the Central Flyway and the population has been estimated at 20 million (Appendix A: Table A2).

Brown-headed Cowbirds breed as yearlings (second year). For the sake of estimating the population for this EA, it is assumed that 75% of the cowbird females breed, the sex ratio is 1:1 males to females, females lay an average of 41 eggs/season, and an average of 13% fledge with 3 (7%) cowbirds developing to maturity from other species rearing them (Lowther 1993). Using these parameters, a breeding population of 20 million in the Central Flyway would have about 7.5 million breeding females that successfully fledge about 21.5 million nestlings, raising the post-fledgling population to about 41.5 million Brown-headed Cowbirds. This would be an increase in the population by a factor of 2.1. It would be expected that the mortality rate through the course of a year for Brown-headed Cowbirds would be higher than other species of blackbirds because of the higher population increase factor as well as smaller size.

KWSP from FY02 to FY06 took an average of 23,000 Brown-headed Cowbirds, with a high of 102,000 in FY06 (Table 10). Under the proposed action (Alternative 1), it is estimated that up to 500,000 might be taken by KWSP. WS in other states, primarily Nebraska, Oklahoma, and Texas took an average of just over 200,000 with a high of 265,000 in FY02 (Table 10). The cumulative impact from all WS State Programs in the Central Flyway averaged 1% of the annual mortality of Brown-headed Cowbirds with a high of 2% in FY02. It is anticipated that the cumulative take of Brown-headed Cowbirds in the Central Flyway, including Kansas, could take up to 1 million (the highest percentage of take being in Texas) for the protection of a variety of resources such as rice and livestock feed, and also the protection of other song birds from nest parasitism. This cumulative take would be less than 5% of the normal annual mortality for Brown-headed Cowbirds in the Central Flyway which is well within the ability of the overall population to withstand. Additionally, private individuals and other agencies take Brown-headed Cowbirds and it is estimated that these entities could take an additional 250,000 cowbirds, especially because several agencies and organizations have programs to protect T&E bird species from Brown-headed Cowbirds. With this information, Table 10 provides a cumulative impact analysis for Brow-headed Cowbird take by KWSP, other WS Programs in the Central Flyway, and private individuals and entities in the Central Flyway, south of the BBS limits. However, the cumulative impact from all sources from FY02 to FY06 has averaged about 1% of the post-breeding population or about 2% of the expected annual mortality. Thus, this level of take would have little impact on the population. KWSP concludes that the current and potential level of take is not expected to have an effect on the Brown-headed Cowbird population.

Table 10. Cumulative impact analysis for Brown-headed Cowbirds killed in Kansas by KWSP, other WS Programs in the Central Flyway, and private individuals and entities (estimated) from FY02 to FY06.

BROWN-HEADED COWBIRD IMPACT ANALYSIS						
	FY02	FY03	FY04	FY05	FY06	Ave.
Est. Breeding Pop.	20,000,000	20,000,000	20,000,000	20,000,000	20,000,000	20,000,000
Breeding Females	7,500,000	7,500,000	7,500, 000	7,500,000	7,500,000	7,500, 000
Ave. Clutch	1	1	1	1	1	1
Ave. Nests	41	41	41	41	41	41
% Survive Fledgling Stage	7%	7%	7%	7%	7%	7%
Young Produced/ Stable Pop. Ann. Mort.	21,500,000	21,500,000	21,500,000	21,500,000	21,500,000	21,500,000
Total Population	41,500,000	41,500,000	41,500,000	41,500,000	41,500,000	41,500,000
KWSP Take	3,573	5,936	1,912	1,954	102,226	23,120
Other WS Take in Central Flyway	352,984	138,650	165,581	160,496	150,287	193,600
WS Take % Central Flyway Ann. Mort.	2%	1%	1%	1%	1%	1%
Private Take in Central Flyway	250,000	250,000	250,000	250,000	250,000	250,000
Total Take	636,110	486,896	443,969	441,698	518,562	505,447
% of Central Flyway Post-breeding Pop.	2%	1%	1%	1%	1%	1%
% of Ann. Mortality	3%	2%	2%	2%	2%	2%

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 2005 on BBS routes (Sauer et al. 2006). However, 1966 to 2005 survey-wide, Central BBS area, and Kansas BBS data show a significant downward trend in the population of -.1.1%/year (*P*<.01), -0.9%/year (*P*=.01), and -1.2 %/year (*P*=.05), respectively. The trend from 1980 to 2005 survey-wide and in the Central BBS Region were similar, but the trend in Kansas increased to -2.5%/year (*P*<.01). These downward trends are almost identical to the Brown-headed Cowbird trends. These declines are thought to have occurred as a result of habitat loss and, in some areas, the spread of the Great-tailed Grackle. Control efforts, especially in eastern United States, have been also theorized as a reason for decline (Peer and Bollinger 1997). The combined United States and Canadian population of Common Grackles has been estimated at 100 million birds, based on winter roost surveys (Meanley and Royall 1976) and 97 million based on BBS data (Rich et al. 2004). The Central Flyway population has been estimated at 19.9 million based on the BBS physiographic regions' relative abundance in each area (Appendix A, Table A3)

Common Grackles breed as yearlings (second year). For the sake of estimating the population for this EA, it is assumed that the Common Grackle sex ratio is 1:1 males to females, 75% of the females breed laying 3-7 eggs with the average of 4.8, and have an average of 1 nest/season (Peer and Bollinger 1997). Grackles renest if their initial attempt fails. Fledgling success was found to be 49%. Using these parameters, a breeding population of 19.9 million in the Central Flyway would have about 7.5 million breeding females that successfully fledge about 17.6 million nestlings, raising the post-fledgling population to about 37.5 million Common Grackles. This would be an increase in the population by a factor of 1.9. Peer et al. (2003) used a factor of 1.45 to estimate the fall population of three blackbird species (Table 8). Thus, about 25% of the population would die from fledging to fall, presumably mostly juveniles. This would be a somewhat high mortality rate from early summer to fall, but could possibly occur.

Natural mortality in blackbird populations is between 50% and 65% of the population each year, regardless of human-caused control operations (USDA 1997). Table 8 gives a Common Grackle population estimate from a detailed study (Peer et al 2003) of about 13 million breeding birds and 19 million fall birds in the northern prairie region (Figure 11). However, this species relative abundance is much higher, with the exception of the small portion of the Black Prairie BBS physiographic region in North Dakota, in the central Plains State (Nebraska, Kansas, and Colorado), suggesting the population estimate in the Central Flyway may be conservative. The population in the Central Flyway has been estimated at 19.9 million (Table 1, Appendix A: Table A3). The numbers that might be taken by KWSP under the proposed action or Alternative 1 are relatively minor (potentially up to 200,000 in any one year, from FY02 to FY06 KWSP averaged 1,600), but up to 1% of the Central Flyway population (Table 11). These numbers are well within normal mortality levels for this species. Other WS mortality in the Central Flyway averaged 90,000 from FY02 to FY06, but potentially could be 500,000, primarily in Oklahoma and Texas (Table 11). This would bring the total to 700,000 in the Central Flyway, about 2% of the Central Flyway total population or 4% of the estimated annual mortality. Additional human-induced mortality of this species occurs from private individuals for this species and could potentially be 200,000 annually. However, WS has no way of knowing what the level of take is by private individuals since permits are not required. With this information, Table 11 provides a cumulative impact analysis for Common Grackle take by KWSP, other WS Programs in the Central Flyway, and other private individuals and entities in the Central Flyway, south of the BBS limits. The cumulative take would be about 2% of the expected annual mortality, well within a level of take that would not cause declines in the population. KWSP concludes that this is a minor level of take and such take would not impact the population.

Table 11. Cumulative impact analysis for Common Grackles killed in Kansas by KWSP, other WS Programs in the Central Flyway, and private individuals and entities (estimated) from FY02 to FY06.

COMMON GRACKLE IMPACT ANALYSIS						
	FY02	FY03	FY04	FY05	FY06	Ave.
Est. Breeding Pop. Central Flyway	19,900,000	19,900,000	19,900,000	19,900,000	19,900,000	19,900,000
Breeding Females	7,500,000	7,500,000	7,500,000	7,500,000	7,500,000	7,500,000
Ave. Clutch	4.8	4.8	4.8	4.8	4.8	4.8
Ave. Nests	1	1	1	1	1	1
% Fledge	49%	49%	49%	49%	49%	49%
Young Fledged/ Stable Pop. Ann. Mort.	17,600,000	17,600,000	17,600,000	17,600,000	17,600,000	17,600,000
Total Population	37,500,000	37,500,000	37,500,000	37,500,000	37,500,000	37,500,000
KWSP Take	813	3,070	982	1,012	1,912	1,558
Other WS Take in Central Flyway	109,663	94,879	71,672	103,933	69,455	89,920
WS Take % Central Flyway Ann. Mort.	1%	1%	0.4%	1%	0.4%	1%
Private Take in Central Flyway	200,000	200,000	200,000	200,000	200,000	200,000
Total Take	310,476	297,949	272,654	304,945	271,367	291,478
% of Central Flyway Post-breeding Pop.	1%	1%	1%	1%	1%	1%
% of Ann. Mortality	2%	2%	2%	2%	2%	2%

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 1966 to 2005 have been positive with increases ranging from 2.9% to 4.2% increase/year, but have not been significant for Kansas, the Central BBS Region, or survey-wide (Sauer et al. 2006). From 1980 to 2005 estimated trends for these areas have been either slightly negative or positive, but have not been significant. In Kansas, Great-tailed Grackles were not abundant enough from 1966 to 1980 to establish a trend, but are now much more common. Their range expansion has been credited to their adaptability to altered habitats such as urban and agricultural landscapes with irrigation (Johnson and Peer 2001). The United States population of Great-tailed Grackles has been estimated at 8 million birds, based on BBS data from the 1990s (Rich et al. 2004). More recent data for just the Central Flyway population estimated the population at 13.0 million based on the BBS physiographic regions' relative abundance in each area (Appendix A: Table A5).

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

Table 12. Cumulative impact analysis for Great-tailed Grackles killed in Kansas by KWSP, other WS Programs in the Central Flyway, and private individuals and entities (estimated) from FY02 to FY06.

GREAT-TAILED GRACKLE IMPACT ANALYSIS						
	FY02	FY03	FY04	FY05	FY06	Ave.
Est. Breeding Pop. Central Flyway	13,000,000	13,000,000	13,000,000	13,000,000	13,000,000	13,000,000
Breeding Females	4,900,000	4,900,000	4,900,000	4,900,000	4,900,000	4,900,000
Ave. Clutch	3.2	3.2	3.2	3.2	3.2	3.2
Ave. Nests	1.37	1.37	1.37	1.37	1.37	1.37
% Fledge	70%	70%	70%	70%	70%	70%
Young Fledged/ Stable Pop. Ann. Mort.	15,000,000	15,000,000	15,000,000	15,000,000	15,000,000	15,000,000
Total Population	28,000,000	28,000,000	28,000,000	28,000,000	28,000,000	28,000,000
KWSP Take	62	160	52	48	77	80
Other WS Take in Central Flyway	15,433	27,540	35,688	61,586	67,266	41,503
WS Take % Central Flyway Ann. Mort.	0.1%	0.2%	0.2%	0.4%	0.4%	0.3%
Private Take in Central Flyway	50,000	50,000	50,000	50,000	50,000	50,000
Total Take	65,495	77,700	85,740	111,634	117,343	91,583
% of Central Flyway Post-breeding Pop.	0.2%	0.3%	0.3%	0.4%	0.4%	0.3%
% of Ann. Mortality	0.4%	0.5%	0.6%	0.7%	0.8%	0.6%

Natural mortality in blackbird populations is between 50% and 65% of the population each year, regardless of human-caused control operations (USDA 1997) and a stable population of Great-tailed Grackles would have a 54% mortality rate under the current assumptions. At the rate of expansion and increase in the grackle's population, it would be expected that the population has had a lower mortality rate with more surviving annually. This is reflected in the various physiographic regions. For example, in the South Texas brushlands, the population has increased in relative abundance from an average of 63.73/count in 1971-1975 to 183.42/count in 2001-2005, a 540% increase in 30 years (Sauer et al. 2006). In Kansas, an area of range expansion, the population has increased from an average of 0.80/count in 1971-1975 to 2.10/count in 2001-2005, a 263% increase in 30 years (Sauer et al. 2006). The numbers that might be taken by KWSP under the proposed action or Alternative 1 are relatively minor (potentially up to 25,000 in any one year, but between FY02 and FY06 it only averaged 80), less than 0.1% of the Central Flyway population annual mortality (Table 12). These numbers are very minor and well within normal mortality levels for this species. Other WS mortality in the Central; Flyway averaged 42,000 from FY02 to FY06, but potentially could be 500,000, primarily in Texas for the protection of citrus crops. This would bring the total to 525,000 in the Central Flyway, about 2% of the Central Flyway total population or 4% of the estimated annual mortality. Additional human-induced mortality of this species occurs from private individuals and could potentially be 200,000 annually. However, KWSP has no way of knowing what the level of take is by private individuals since permits are not required. With this information, Table 12 provides a cumulative impact analysis for Great-tailed Grackle take by KWSP, other Central Flyway WS Programs, and private individuals and entities in the Central Flyway, south of the BBS limits. The estimated cumulative impact from all sources would is less than 1% of the expected annual mortality, well within a level of take that would not cause declines in the population. KWSP concludes that this is a minor level of take andwould not impact the population.

Yellow-headed Blackbird Population Impacts. The Yellow-headed Blackbird breeds in north central western states including the northern states and provinces in the Central Flyway. It requires emergent wetland habitat for breeding and is limited by its distribution. The Yellow-headed Blackbird begins migration to its wintering grounds in southern Arizona, New Mexico and southwest Texas south into Mexico starting in July and finishes by mid-September, mostly coinciding with the completion of its pre-basic molt (their migration is missed by both CBC and BBS). Yellow-headed Blackbirds mostly miss BDM activities conducted by WS in the Central Flyway, except for those that linger prior to heading for their wintering grounds. However, its migration coincides with the ripening of some sunflowers and, therefore, it may be involved in some BDM activities. Estimated trends from 1966 and 1980 to 2005 have been slightly positive for the Central BBS Region and survey-wide (0.7%-1.1%/year), but have not been significant (Sauer et al. 2006). However, in Kansas, the trend was from 1966 to 2005 was -2.9%/year and the relative abundance dropped from 2.96 birds/route to 1.69 birds/route, a 41% drop in the population. This is due to the loss of nesting habitat from drought and development (Twedt and Crawford 1995). The population of Yellow-headed Blackbirds was estimated at 23 million based on BBS data from the 1990s (Rich et al. 2004). A detailed study in the northern prairie pothole region (Peer et al. 2003) estimated 11.6 million Yellow-headed Blackbirds in that area. More recent BBS data (2001-2005), estimated the population at 8.8 million for the Central Flyway based on the BBS physiographic regions' relative abundance in each area (Appendix A: Table A6). This will be the population estimate used for this EA.

Yellow-headed Blackbirds breed as yearlings (second year). For the sake of estimating the population for this EA, it is assumed that 75% of the blackbird females breed, the sex ratio is 1:1 males to females, females lay 1-5 eggs with an average of 3.2-4.0 eggs/nest (3.2 will be used for the EA), and average 3 nests/season (Twedt and Crawford 1995). Averages of 2.1 nestlings fledge the first nest, 1.0 from the second, and 0.9 from the third for an egg to fledgling success of 42%. Using these parameters, a breeding population of 8.8 million in the Central Flyway would have about 3.3 million breeding females that successfully fledge about 13.3 million nestlings, raising the post-fledgling population to about 22.1 million Yellow-headed Blackbirds. This would be an increase in the population by a factor of 2.5, somewhat higher than other blackbirds.

Natural mortality in blackbird populations is between 50% and 65% of the population each year, regardless of human-caused control operations (USDA 1997) and a stable population of Yellow-headed Blackbirds would have a 78% mortality rate under the current assumptions (includes nestlings that die before fledging) which is fairly substantial. However, mortality following fledging would be 60%, thus, 18% die between hatching and fledging. The numbers that might be taken by KWSP under the proposed action or Alternative 1 are relatively minor (potentially up to 25,000 in any one year, FY02-FY06 averaged 71), less than 0.1% of the Central Flyway population annual mortality (Table 13). The numbers are very minor and mostly unnoticeable at th population level. Other WS mortality in the Central Flyway averaged even less than Kansas from FY02 to FY06 (Table 13), but potentially could be 100,000 (this would likely be high unless more active programs were initiated to protect early ripening crops). This would bring the total to 125,000 in the Central Flyway, less than 1% of the Central Flyway total population and estimated annual mortality. Additional human-induced mortality of this species occurs from private individuals and could potentially be 25,000 annually (Yellow-headed Blackbirds are not the focus of most all large-scale projects and likely to even be less taken). However, KWSP has no way of knowing what the level of take is by private individuals since permits are not required. With this information, Table 13 provides a cumulative impact analysis for Yellow-headed Blackbird take by KWSP, other Central Flyway WS Programs, and other private individuals and entities in the Central Flyway, south of the BBS limits. The cumulative impact would be about 0.2% of the expected annual mortality, well within a level of take that would not cause declines in the population. KWSP concludes that this is a negligible level of take which will not impact the population.

Table 13. Cumulative impact analysis for Yellow-headed Blackbirds killed in Kansas by KWSP, other WS Programs in the Central Flyway, and private individuals and entities (estimated) from FY02 to FY06.

YELLOW-HEADED BLACKBIRD IMPACT ANALYSIS						
	FY02	FY03	FY04	FY05	FY06	Ave.
Est. Breeding Pop. Central Flyway	8,800,000	8,800,000	8,800,000	8,800,000	8,800,000	8,800,000
Breeding Females	3,300,000	3,300,000	3,300,000	3,300,000	3,300,000	3,300,000
Ave. Clutch	3.2	3.2	3.2	3.2	3.2	3.2
Ave. Nests	3	3	3	3	3	3
% Fledge	42%	42%	42%	42%	42%	42%
Young Fledged/ Stable Pop. Ann. Mort.	13,300,000	13,300,000	13,300,000	13,300,000	13,300,000	13,300,000
Total Population	22,100,000	22,100,000	22,100,000	22,100,000	22,100,000	22,100,000
KWSP Take	36	138	45	46	89	71
Other WS Take in Central Flyway	15	1	2	1	2	4
WS Take % Central Flyway Ann. Mort.	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Private Take in Central Flyway	25,000	25,000	25,000	25,000	25,000	25,000
Total Take	25,051	25,139	25,047	25,047	25,091	25,075
% of Central Flyway Post-breeding Pop.	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%
% of Ann. Mortality	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%

Brewer's Blackbird Population Impacts. The Brewer's Blackbird breeds in western and northern states in the Central Flyway and not in Kansas. Its population's range expanded in the early 1900s eastward and northward facilitated by human habitat modifications, principally forest clearing for farming, logging, and railroad and highway development. Its winter range includes parts of Colorado, Kansas and southward in the Central Flyway. Estimated trends from 1966 and 1980 to 2005 have been slightly positive for the Central BBS Region (0.2%-0.5%/year), but have not been significant. However, survey-wide BBS data have shown significant population declines of -1.3%/year (P<.01) for 1966-2005 and -1.5%/year (P<.01) for 1980-2005. The population of Brewer's Blackbirds was estimated at 35 million based on BBS data from the 1990s (Rich et al. 2004). More recent BBS data (2001-2005), estimated the population at 6.1 million for the Central Flyway based on the BBS physiographic regions' relative abundance in each area (Appendix A: Table A4).

Brewer's Blackbirds breed as yearlings (second year). For the sake of estimating the population for this EA, it is assumed that 75% of the blackbird females breed, the sex ratio is 1:1 males to females, females lay 1-8 eggs with an average eggs/nest of 5.0, and an average nests/season of 1 (Martin 2002). About 63% of the eggs hatch with subsequent fledgling success 63%, for an egg to fledgling success of 40%. Using these parameters, a breeding population of 6.1 million in the Central Flyway would have about 2.3 million breeding females that successfully fledge about 4.6 million nestlings, raising the post-fledgling population to about 10.7 million Brewer's Blackbirds. This would be an increase in the population by a factor of 1.8, similar to other blackbirds.

Natural mortality in blackbird populations is between 50% and 65% of the population each year, regardless of human-caused control operations (USDA 1997) and a stable population of Brewer's Blackbirds would have a 54% mortality rate under the current assumptions (includes nestlings that die before fledging). The numbers that might be taken by KWSP under the proposed action or Alternative 1 have been negligible averaging 40 annually from FY02 to FY06 (potentially up to 25,000 in any one year, about 0.5% of the annual mortality - Table 14). These numbers are very minor and well within normal mortality levels for this species. Other WS mortality averaged almost 16,000 from FY02 to FY06, but potentially could be 100,000. This would bring the total to 125,000 in the Central Flyway, about 1% of the Central Flyway total population or 3% of the estimated annual mortality (Table 14). Additional human-induced mortality of this species occurs from private individuals and could potentially be 25,000 annually (Brewer's Blackbirds are not as much the focus of large-scale projects and likely to even be less taken). However, KWSP has no way of knowing what the level of take is by private individuals since permits are not required. With this information, Table 14 provides a cumulative impact analysis for Brewer's Blackbird take by KWSP, other Central Flyway WS Programs, and private individuals and entities in the Central Flyway, south of the BBS limits. This would only slightly raise the level of take, but it would remain at about 3% of the expected annual mortality, well within a level of take that would not cause declines in the population. KWSP concludes that this is a minor level of take that would not impact the population.

Table 14. Cumulative impact analysis for Brewer's Blackbirds killed in Kansas by KWSP, other WS Programs in the Central Flyway, and private individuals and entities (estimated) from FY02 to FY06.

BREWER'S BLACKBIRD IMPACT ANALYSIS						
	FY02	FY03	FY04	FY05	FY06	Ave.
Est. Breeding Pop. Central Flyway	6,100,000	6,100,000	6,100,000	6,100,000	6,100,000	6,100,000
Breeding Females	2,300,000	2,300,000	2300,000	2,300,000	2,300,000	2,300,000
Ave. Clutch	5.0	5.0	5.0	5.0	5.0	5.0
Ave. Nests	1	1	1	1	1	1
% Fledge	40%	40%	40%	40%	40%	40%
Young Fledged/ Stable Pop. Ann. Mort.	4,600,000	4,600,000	4,600,000	4,600,000	4,600,000	4,600,000
Total Population	10,700,000	10,700,000	10,700,000	10,700,000	10,700,000	10,700,000
KWSP Take	41	90	19	26	18	39
Other WS Take in Central Flyway	20,384	16,129	11,387	18,618	11,777	15,659
WS Take % Central Flyway Ann. Mort.	0.4%	0.4%	0.2%	0.4%	0.3%	0.3%
Private Take in Central Flyway	25,000	25,000	25,000	25,000	25,000	25,000
Total Take	45,425	41,219	36,406	43,644	36,795	40,698
% of Central Flyway Post-breeding Pop.	0.4%	0.4%	0.3%	0.4%	0.3%	0.4%
% of Ann. Mortality	1%	1%	1%	1%	1%	1%

Rusty Blackbird Population Impacts. Rusty Blackbirds breed in Canada and Alaska and winter in the southeastern United States. Its winter range includes the eastern portions of the southeastern states, South Dakota and south, in the Central Flyway. Rusty Blackbirds often feed, primarily on invertebrates, in wet woodlands and streams, and even though they will roost with other blackbirds, usually will not feed with them. Estimated trends from 1966 and 1980 to 2005 have been significantly (P<.01) negative survey-wide at -12.50%/year and -9.4%/year, respectively. Declines have been linked to a loss of wet woodland breeding habitat (Avery 1995). The population of Rusty Blackbirds was estimated at 2.0 million based on BBS data from the 1990s (Rich et al. 2004). More recent BBS data (2001-2005), estimated the population at 67,000 for the Central Flyway based on the BBS physiographic regions' relative abundance in each area (Table 1).

Rusty Blackbirds breed as yearlings (second year). For the sake of estimating the population for this EA, it is assumed that 75% of the blackbird females breed, the sex ratio is 1:1 males to females, and females lay an average eggs/nest of 4.5 eggs/nest and have 1 nest/season (Avery 1995). No other data was available, but it assumed that from egg to fledgling, success is 40% (using Brewer's Blackbird parameters). Using these parameters, a breeding population of 67,000 in the Central Flyway would have about 25,000 breeding females that successfully fledge about 45,000 nestlings, raising the post-fledgling population to about 112,000 Rusty Blackbirds. This would be an increase in the population by a factor of 1.7, similar to other blackbirds.

Natural mortality in blackbird populations is between 50% and 65% of the population each year, regardless of human-caused control operations (USDA 1997) and a stable population of Rusty Blackbirds would have a 53% mortality rate under the current assumptions and an assumption that 67% of the eggs in a nest hatch (the mortality rate includes nestlings that die before fledging). The numbers that might be taken by KWSP under the proposed action or Alternative 1 are relatively minor (potentially up to 100 in any one year, FY02-FY06 averaged 4), less than 0.1% of the Central Flyway population annual mortality

(Table 15). These numbers are very minor and well within normal mortality levels for this species. Other WS mortality averaged about 30 from FY02 to FY06, but potentially could an additional 500 (Table 15). This would bring the total to 1,000 in the Central Flyway, about 1% of the Central Flyway total population or 2% of the estimated annual mortality. Additional human-induced mortality of this species occurs from private individuals and could potentially be 500 annually (Rusty Blackbirds, similar to the Brewer's Blackbird, are not as much the focus of BDM projects and likely to even fewer taken than the given estimate). However, KWSP has no way of knowing what the level of take is by private individuals since permits are not required. Additionally, it should be noted that Rusty Blackbirds are the species not likely to be taken protecting crops because during winter they mostly feed in wet woodland bottoms on acorns, pine seeds, fruits, and animal matter, but sometimes will be found in feedlots (Avery 1995). To provide an analysis of potential impacts we will assume that Rusty Blackbirds are taken proportionately with other blackbirds. With this information, Table 15 provides a cumulative impact analysis for Rusty Blackbird take by KWSP, other Central Flyway WS Programs, and other private individuals and entities in the Central Flyway, south of the BBS limits. The cumulative take was about 1% of the expected annual mortality from FY02 to FY06, well within a level of take that would not cause declines in the population. KWSP concludes that this is a minor level of take that would not impact the population. The loss of wetland nesting habitat is attributed to their decline.

Table 15. Cumulative impact analysis for Rusty Blackbirds killed in Kansas by KWSP, other WS Programs in the Central Flyway, and private individuals and entities (estimated) from FY02 to FY06.

RUSTY BLACKBIRD IMPACT ANALYSIS						
	FY02	FY03	FY04	FY05	FY06	Ave.
Est. Breeding Pop. Central Flyway	67,000	67,000	67,000	67,000	67,000	67,000
Breeding Females	25,000	25,000	25,000	25,000	25,000	25,000
Ave. Clutch	4.5	4.5	4.5	4.5	4.5	4.5
Ave. Nests	1	1	1	1	1	1
% Fledge	40%	40%	40%	40%	40%	40%
Young Fledged/ Stable Pop. Ann. Mort.	45,000	45,000	45,000	45,000	45,000	45,000
Total Population	112,000	112,000	112,000	112,000	112,000	112,000
KWSP Take	6	10	1	3	0	4
Other WS Take in Central Flyway	39	27	21	29	20	27
WS Take % Central Flyway Ann. Mort.	0.1%	0.1%	0.0%	0.1%	0.0%	0.1%
Private Take in Central Flyway	500	500	500	500	500	500
Total Take	545	537	522	532	520	531
% of Central Flyway Post-breeding Pop.	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
% of Ann. Mortality	1%	1%	1%	1%	1%	1%

Waterfowl Impacts

Many species of waterfowl have increased in numbers in the last few decades following years of decline for many. Conservation efforts over the last several decades such as closely regulating hunter harvest, slowing the loss of wetlands, and improving the quality of wetland habitat have helped reverse the decline of many waterfowl species. In response to the efforts by wildlife managers, sportsmen, conservationists, and others, waterfowl populations, particularly Canada Geese and Mallards, have flourished in recent years. As a result, some species of waterfowl are overabundant in areas where they cause damage to agricultural crops, property, and other resources, and can pose a threat to human health and safety, especially at airports. Of the 25 species that breed in the Central BBS area (including Sandhill Crane, American Coot, and Common Moorhen), only one has exhibited a significant negative trend (Mottled Duck – breeders have been reported in south-central Kansas) and 8 showed significant positive trends from 1966 to 2005 (Sauer et al. 2006). From 1980 to 2005, 8 species again showed significant positive trends (2 new species) and no significant negative trends (Sauer et al. 2006). The Mottled Duck remained in a nonsignificant negative trend and all other species had nonsignificant positive trends. With this upward trend for most species of waterfowl, hunting seasons and bag limits in Kansas have become more liberal.

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

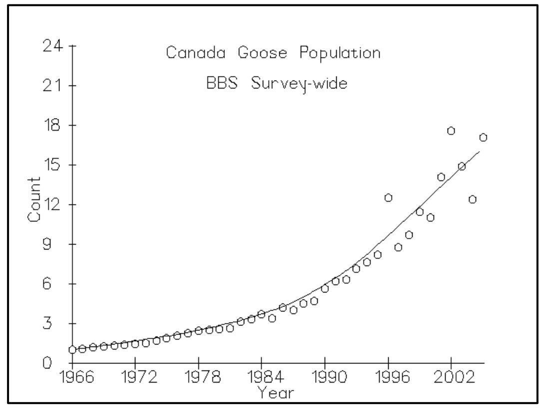

Figure 12. BBS survey-wide Canada Goose population trend (*from* Sauer et al. 2006).

KWSP killed 7 species of waterfowl from FY02 to FY06, but has the potential of taking several others (see Appendix C). KWSP averaged taking less than 5 Northern Pintails, Gadwalls, Northern Shovelers, Blue-winged Teals, and Wood Ducks and all of these species are common in the Central Flyway (Kansas hunters took an average of 4,621, 32,133, 4,217, 17,565, and 3,100 in the 2001-2005 hunting seasons (USFWS 2006a), respectively, basically corresponding with the FY02-FY06 FYs). The take of a few of these species will have no effect on their population, and compared to hunting, KWSP took less than 0.1% of the total average take from FY02 to FY06 and in any year and had very minor effect on these species. KWSP took an average of 47 Canada Geese and 29 Mallards from FY02 to FY06; the majority of this take was associated with wildlife hazard management at airports. For comparison, Kansas waterfowl hunters took an average of 101,000 Mallards and 94,000 Canada Geese during the 2001 to 2005 hunting seasons. In the Central flyway alone, waterfowl hunters took an average of 990,000 Mallards and 640,000 Canada Geese during the 2001 to 2005 hunting seasons (USFWS 2006a). The estimated populations in North America for these two species in 2005-2006 surveys was over 7 million and 6 million, respectively (USFWS 2006c). Thus, KWSP was responsible for less than 0.1% of the mortality for these species in Kansas. Therefore, KWSP concludes that none of the waterfowl take by KWSP has had the potential to negatively effect the waterfowl populations and does not anticipate such. KWSP could potentially have an impact on a very local level (removal of all geese from a residential pond), primarily in an urban area where Canada Geese were overabundant and agencies or organizations such as a homeowner's association wanted them removed, but it would not effect the overall population.

Mortality for waterfowl from other sources can be high to local populations of waterfowl and cranes. Botulism, caused from toxins produced by bacteria, is a common disease in waterfowl and can have devastating effects on local waterfowl populations. It occurs in all parts of the nation but is most prevalent in western and northern plains states. In certain years, mortality due to botulism in the west has been estimated at several million waterfowl (Locke and Friend 1989).

The numbers of waterfowl taken by KWSP are so low in comparison to mortality from hunter harvest as well as from natural causes that KWSP BDM activities virtually have no impact on waterfowl populations. KWSP does not anticipate any substantial increases in take of waterfowl species, except potentially "resident" Canada Geese. Canada Geese in the Central Flyway averaged a population of 450,000 during the 2004 to 2006 winter waterfowl surveys and are above the population management objective of 250,000 set by the States and USFWS (USFWS 2006a Clearly, the minimal mortality by KWSP would not likely reduce the population to meet the management objective and would not impact the population.

Wading Bird Impacts

Twelve species of wading birds are found in Kansas (Appendix C). KWSP took 5 different species of wading birds (Table 4), egrets and herons, from FY02 to FY06. KWSP took an average of one or less Snowy Egret, Great Egret, Great Blue Heron, and Little Blue Heron annually from FY02 to FY06. All are fairly common in the Central BBS area during the breeding season (a few on the edge of their range in Kansas) and the take of one or less would not affect their populations. KWSP did take an average of 34 Cattle Egrets from FY02 to FY06, primarily for the protection of human health and safety and aircraft at airports. These birds are native to Portugal, Spain and Africa; they first appeared in South America around the turn of the century. It is thought that cattle egrets were self-introduced to the New World, perhaps after being caught in high winds or a storm system. Since the early 1960's, the cattle egret has increased in population size and has extended its range throughout North America (Telfair 1983, 2006, Baumgartner and Baumgartner 1992). In Kansas, Cattle Egrets increased from about 0.5 birds/BBS count in 1967 to 2.2 birds/BBS count in 2005 (Sauer et al. 2006). However, trend data for Kansas is a nonsignificant positive increase during that time. Even with current control efforts, the population appears to have increased. Therefore, KWSP believes that it has not had any effect on the population. Additionally, it is believed that the population in the Central Flyway is large enough to withstand the take of hundreds of thousands cattle egrets. KWSP'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. KWSP' 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, KWSP BDM activities should have no significant cumulative impact on cattle egrets or other wading birds, and no significant cumulative impacts are expected to occur.

Gull Impacts

Four species of gulls are consistently found in Kansas with most only migrating through Kansas from northern breeding grounds. Three of these, the Ring-billed Gull, Franklin's Gull, and Bonaparte's Gull have been taken in BDM activities by KWSP; from FY02 to FY06, KWSP took an average of 14, 7, and 3, respectively. 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 and 1980 to 2005 in the Central BBS area have shown a non-significant increase of 2.5%/year (P=.32) and 7.1%/year (P=.13). 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. The Bonaparte's Gull primarily nests in areas north of the BBS limits, thus limited data is available for them, but CBC data from 1966 to 2005 for winter populations in the United States appear to have been fairly stable around 1/party hour observed (Burger and Gochfeld 2002, NAS 2007). Available data reflect stable to increasing populations of gulls in the Central BBS region and, thus, it appears that the limited take from KWSP and other permitted activities elsewhere, have not had a negative impact on these species populations. KWSP does not anticipate taking many more gulls than were taken from FY02 to FY06, and, at most, this could potentially be up to a few hundred gulls per year. It is concluded that the minor take by KWSP has and will not have an effect on the gull populations and KWSP does not believe that, from looking at the best available data, even the take of a few hundred gulls would cause declines in their populations.

Dove Impacts

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

Mourning Dove populations increased in the United States with the westward expansion of settlers. Recent data suggest that the breeding population of Mourning Doves is 114 million survey-wide (Rich et al. 2004) and 43 million in the Central Flyway (Appendix A, Table A10). BBS data from 1966 to 2005 and 1980 to 2005 show significant (P<.01) negative trends in the Central BBS area of -0.4%/year from 1966 to 2005 and -0.7%/year from 1980 to 200 for Mourning Doves. Other BBS data for Kansas and survey-wide have shown similar declining trends or a somewhat stable population, but have not been significant. The Mourning Dove is ranked high in relative abundance on BBS routes and is among the top ten most abundant species in the United States (Mirarchi and Baskett 1994). However, as suggested by BBS trends, populations have declined in recent years likely as a result of land-use changes such as intensive, cleaner farming, removal of shelterbelts and fencerows, shifts in land use such as from agriculture to intensive forestry, grain crops to cotton, shrubland to grazing lands, or natural habitats to urban areas, and other sources of habitat loss (Mirarchi and Baskett 1994). Even so, the Mourning Dove is still abundant.

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

Doves are classified as migratory game birds that are managed by state game departments. Estimated take by sport hunters during 2003 was 853,600 birds (USFWS 2006b). Most mourning dove mortality from KWSP BDM activities takes place at regional airports. KWSP takes, on average, about 30 doves per year from FY02 to FY06 (Table 4) much less than 0.1% of the annual harvest by hunters. Thus, KWSP has had a very minor impact on dove populations in Kansas. The anticipated number of doves killed by KWSP will be so low in comparison to sport hunter harvest that KWSP will add to the cumulative harvest fairly insignificantly.

Impacts to Other Birds

KWSP takes few other birds, and very few of any one species. Many of the other birds (e.g., Red-tailed Hawks, Upland Sandpipers, Killdeer, Eastern Meadowlarks, and Horned Larks) are taken at airports where many cannot be frightened using standard hazing techniques and, therefore, are trapped or shot, sometimes to reinforce hazing, so they do not cause damage to aircraft. Raptors and shorebirds are often struck by aircraft causing serious damage to the aircraft with the potential to cause a catastrophic incident. Raptors are mostly struck while they are hunting and they do not seem to yield airspace to other birds (including aircraft) and are difficult to haze with pyrotechnics or other scare devices. KWSP took a total of 2 raptors, Red-tailed Hawks, at airports from FY02 to FY06. KWSP also took two non-flocking shorebirds at airports, an average of 2 Killdeer and 1 Upland Sandpipers per year from FY02 to FY06. These species are common in the air operating area of an airport and are not easily hazed. Additionally, KWSP was involved in sampling different migratory birds, primarily shorebirds and waterfowl, for the H5N1 strain of AI as part of a national surveillance program. These species populations are abundant and the take of a few would have no effect on their population. KWSP does not anticipate taking more than a few other species annually, and this would not impact any population. Appendix C: Tables C1 and C3 lists those species with that KWSP 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 FY02 to FY06. It is concluded that the minor take by KWSP has and will not have an effect on the other species' populations.

KWSP did not lethally target any federally or state listed T&E species from FY02 to FY06, and does not anticipate such requests. This would only be done after obtaining the necessary permit for such an activity. KWSP did take 2 listed USFWS (1995) Species of Management Concern, the Upland Sandpiper and Eastern Meadowlark, with a total of 7 and 3 taken from FY02 to FY06. Both species showed signs of declines from 1980 to 2005 in Kansas at -1.9%/year (P=.07) and -2.6%/year (P<.01), but have recently displayed increasing trends from 2001 to 2005 of 6.1%/year (P=.14) and 15.1%/year (P<.01), respectively (Sauer et al. 2006). The relative abundance of both species was rather high at 7.24 and 32.5 birds/count; these relative abundances, without estimates of detectability (for Eastern Meadowlark determined to be 2.38 (Rich et al. 2004) would provide estimates of 60,000 and 270,000 breeding birds in Kansas. Take by KWSP would represent less than 0.01% of the breeding population and a very minor impact on the population. Thus, KWSP concludes that impacts to T&E and sensitive species by KWSP have been minor to nonexistent.

Impacts on Bird Populations from Nonlethal Methods in BDM

KWSP hazed or captured and released (disease monitoring) or relocated at least 66 species ("Other Passerines" is as species code in the MIS for songbirds that rarely cause damage and may have been more that one species), had the potential to cause damage, or were involved in disease monitoring from FY02 to FY06 (Table 4). Of these, 22 species were primarily hazed annually in Kansas (annually hazed >100 of a species from FY02 to FY06). However, KWSP could potentially conduct nonlethal BDM for many more species (Appendix C: Tables C1 and C3). Operationally, KWSP conducts most all hazing activities at airports where birds are an aviation strike hazard. The species that cause damage in Kansas are listed in Section 1.2 with general information about them and which agency, USFWS, KPDW, or KWSP has primary responsibility for responding to damage complaints that involve these species. KWSP would conduct BDM for these species.

Table 16. Birds hazed (scared with frightening devices or other nonlethal method) from damage situations from FY02 to FY06 by KWSP.

Species	FY02	FY03	FY04	FY05	FY06	Ave
Commensal Birds						
European Starling*	84,301	7,078	2,205,560	9,432,514	247,674	2,395,425
Feral (Rock) Pigeon	802	67	75	136	2,170	650
House Sparrow	1	-	-	15	58	15
Blackbirds						
Red-winged Blackbird*	1,640	642	322,644	93,144	113	83,637
Brown-headed Cowbird*	1,125	239	2,319	12,352	8,702	4,947
Common Grackle*	169	426	2,474	13,695	75	3,368
Brewer's Blackbird*	37	7	414	3,815	6	856
Great-tailed Grackle*	31	369	1,214	329	0	389
Yellow-headed Blackbird*	1	0	12	122	0	27
Rusty Blackbird*	0	0	23	44	0	13
Waterfowl						
Canada Goose	9,511	7,769	42,514	4,906 (49)	11,303	15,201
Mallard	429	954	771	121	793	614
Double-crested Cormorant	760	16	40	-	-	163
Blue-winged Teal	101	72	12	8	-	39
Green-winged Teal	-	-	4	-	126	26
Hooded Merganser	51	-	-	-	-	10
Common Goldeneye	40	10	-	-	-	10
Gadwall	27	12	-	-	-	8
Northern Shoveler	-	-	-	22	-	4
American Coot	16	-	-	-	-	3
Bufflehead	-	12	-	-	-	2
Wood Duck	8	-	-	-	-	2
American Wigeon	-	-	8	-	-	2
Common Merganser	6	-	-	-	-	1
Northern Pintail	2	-	-	-	-	0
Wading Birds						
Cattle Egret	1,468	892	2,806	-	602	1,154
Snowy Egret	508	4	-	-	300	162
Great Egret	110	4	2	-	142	52
Little Blue Heron	9	-	-	-	66	15
Great Blue Heron	5	8	-	-	10	5
White-faced Ibis	-	-	-	-	16	3
Gulls						
Ring-billed Gull	2,134	3,050	136	1,005	969	1,459
Franklin's Gull	-	1,720	-	300	330	470
Bonaparte's Gull	-	614	-	200	89	181
Forster's Tern	55	-	-	-	-	11
Belted Kingfisher	-	1	-	-	-	0
Raptors						
Red-tailed Hawk	58	148	165	46	146	113
American Kestrel	48	29	8	12	91	38
Northern Harrier	13	-	2	-	3	4
Swainson's Hawk	4	4	-	-	9	3
Merlin	6	2	-	-	-	2
Cooper's Hawk	-	-	-	2	-	0
Turkey Vulture	1	-	-	- (1)	-	0
Shorebirds						
Killdeer	326	343	14	40	14	147
Upland Sandpiper	56	11	40	-	-	21
Wilson's Phalarope	-	-	-	-	13	3
American Golden-Plover	-	-	-	-	3	1
Lesser Yellowlegs	-	-	-	-	3	1
Spotted Sandpiper	-	-	-	-	3	1
Snowy Plover	-	-	-	-	1	0
Greater Yellowlegs	-	-	-	-	1	0
Miscellaneous Birds						
American Crow	1,134	1,205	3,036	3,188	55	1,724
Mourning Dove	2,366	2,816	120	200	1,385	1,377
Cliff Swallow	76	-	-	1,350	300	345
Eastern Meadowlark	155	14	264	16	175	125
American Robin	210	320	-	-	-	106
Barn Swallow	404	2	18	-	-	85
Horned Lark	-	-	-	96	254	70
Western Meadowlark	-	-	-	-	53	11
Ring-necked Pheasant	4	8	-	-	9	4
Northern Flicker	8	-	-	3	5	3
Eastern Kingbird	-	-	-	-	4	1
House Finch	-	-	-	-	4	1
Eastern Phoebe	-	-	-	-	1	0
Scissor-tailed Flycatcher	-	-	-	-	1	0
Passerine Other	99	26	-	-	-	26

*Numbers were estimated for blackbirds recorded as mixed blackbirds hazed or freed with nonlethal BDM methods for winter (12/01 to 03/31) projects according to CBC data (NAS 2007), and for the remainder of the year by the average between BBS (Sauer et al. 2006) and CBC (NAS 2007) data.

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

The primary target species hazed by KWSP annually in Kansas are starlings (95%), Red-winged Blackbirds (3%), and Canada Geese (1%). The remaining 62 species combined and the other passerine category account for 1% of the nonlethal BDM conducted by KWSP. Table 16 lists the species and numbers hazed by KWSP from FY02 to FY06. KWSP did haze one State listed T&E species at an airport, a Snowy Plover in FY06, and four USFWS (1995) Species of Management Concern, the White-faced Ibis, Northern Harrier, Upland Sandpiper, and Eastern Meadowlark, averaging 3, 4, 21, and 125 hazed from FY02 to FY06. These species were hazed from the air operating areas of airports which is a beneficial impact for those that respond because hazing moves them to locations out of harms way.

KWSP averaged hazing about 2.5 million birds annually from FY02 to FY06. KWSP conducted most hazing at airports to prevent airstrikes. KWSP has not conducted urban roost hazing frequently, but could with those species such as Turkey Vultures, egrets and herons, and starlings that cause human health and safety concerns. Capture and relocate programs are done for relatively few birds and involved mostly Canada Geese. Monitoring for disease (capture, sample, and release) was conducted on relatively few birds and involved mostly shorebirds. KWSP concludes that the nonlethal BDM activities have been beneficial in reducing damage or monitoring for disease and not created environmental concerns.

4.1.1.2 Alternative 2 - Nonlethal BDM by KWSP Only. Under this alternative, KWSP would not take any target species because lethal methods would not be used. Nonlethal activities conducted by KWSP would likely intensify, but result in similar levels of nonlethal activities as conducted under Alternative 1 with similar numbers of birds hazed or captured and released or relocated (Table 16). Nonlethal harassment, could be ineffective on some bird species, in particular pigeons, and some birds would quickly become habituated to harassment techniques, and, thus, where lethal techniques would be implemented to reinforce hazing efforts, KWSP 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 KWSP'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 and A-C are currently available for use only by KWSP and could not be used by the public. This would likely lead to less species being taken under this alternative with chemical BDM methods. Additionally, not all private individuals would want to obtain a depredation permit from USFWS, and, thus, less migratory birds requiring a permit would likely be taken. As a result, this alternative would likely lead to private entities having similar or less impacts to target bird species populations as described under Alternative 1. For the same reasons shown in the population impacts analysis in section 4.1.1.1, it is unlikely that starlings, feral pigeons, House Sparrows, blackbirds, Canada Geese, or other target bird populations would be impacted significantly by implementation of this alternative. Impacts and hypothetical risks of illegal chemicals and other methods under this alternative as described in Sections 2.1.3 and 2.2.3 would probably be greater than the proposed action, similar to Alternative 3, but less than Alternative 4. The use of illegal methods would lead to unknown risks to target species populations.

4.1.1.3 Alternative 3 - KWSP Provides Technical Assistance Only for BDM. Under this alternative, KWSP would have no impact on any bird species population in Kansas because the program would not conduct any operational BDM activities. KWSP would offer advice on the BDM techniques that could be used to resolve different damage problems. Private efforts to reduce or prevent bird damage and perceived disease transmission risks would increase under this alternative and take would be similar to, but likely less than, the proposed action which would result in similar impacts on bird populations. DRC-1339 and A-C 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 KWSP 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 and 2.2.3 could lead to real but unknown impacts on target bird populations. Impacts and hypothetical risks of illegal chemical toxicant use under this alternative would probably be more than under Alternative 2 and less than under Alternative 4.

4.1.1.4 Alternative 4 - No Federal KWSP BDM. Under this alternative, KWSP would have no impact on any bird species populations in Kansas. Private efforts to reduce or prevent depredations would increase which would result in impacts on target species populations similar to those that would occur under Alternative 1. However, impacts on target species under this alternative could be the same, less, or more than those of the proposed action depending on the level of effort expended by private persons. For the same reasons shown in the population impacts analysis in section 4.1.1.1 it is unlikely that any target bird populations would be impacted significantly by implementation of this alternative. DRC-1339 and A-C are currently only available for use by KWSP 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 and 2.2.3 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 KWSP, other agencies, or the public. Impacts can range from direct take while implementing BDM methods to indirect impacts resulting from implementing BDM methods (e.g., birds entangled in netting meant only to keep them out of an area) and reduction of a bird species in a given area (positive impact on nesting song birds from the removal of brow-headed cowbirds where nest parasitism is high as discussed in Section 1.3.7). Measures are often incorporated into BDM to reduce impacts to nontarget species. Various factors may, at times, preclude use of certain methods, so it is important to maintain the widest possible selection of BDM tools for resolving bird damage problems. However, the BDM methods used to resolve damage must be legal and biologically sound. Often, but not always, impacts to nontarget species can be minimized. Where impacts occur, they are mostly of low magnitude in terms of nontarget species populations. Following is a discussion of the various impacts under the alternatives.

4.1.2.1 Alternative 1 - Continue the Current Federal BDM Program. KWSP did not take any nontarget species during BDM activities from FY02 to FY06, and likely has been extremely low to nonexistent. 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 KWSP. However, even hazards to nontarget species with rice baits were found to be low (Cummings et al. These occurrences are rare and should not affect the overall populations of any species under the current program. KWSP did not document any such occurrences from FY02 to FY06.

KWSP 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, KWSP does not anticipate that populations of either species has been effected by BDM. BDM for these species would have to be focused during the nesting period when and where KWSP could reduce these species breeding populations during a critical time period, for example during the nesting season of the Black-capped Vireo (if a population were found in Kansas). The take of gulls invading a nesting colony of Interior Least Terns or Snowy Plovers could also be beneficial for these species. However, it would have to be focused specifically on gulls impacting a nesting colony. KWSP is not currently conducting such activities, but WS nationally conducts many BDM projects for the benefit of other wildlife species with many successes.

<u>T&E Species Impacts</u>. KWSP has not had an impact on any federally listed T&E or candidate species (Table 2) in Kansas, including the Whooping Crane, from FY97 to FY06. 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 1997, Appendix P and Q). Those measures and characteristics should assure there would be no jeopardy to T&E species or adverse impacts on mammalian or non-T&E bird scavengers from the proposed action. None of the other control methods described in the proposed action alternative pose any hazard to nontarget or T&E species. Examples of potential benefits to a listed T&E species would be the reduction of local cowbird populations which could reduce nest parasitism on the endangered black-capped vireo, or the management of birds that could directly predate on adult interior least terns, their nests, eggs or young, as discussed above.

Other sensitive species in Kansas were given in Section 2.1.2.3 and those bird species are denoted in Appendix C. Other than the sensitive species targeted during BDM, discussed in Section 4.1.1.1, KWSP has not had any impacts on them from FY97 to FY06. KWSP does anticipate that BDM will have more than a minor impact on any such species, and are more likely to be taken as targets in BDM.

4.1.2.2 Alternative 2 - Nonlethal BDM by KWSP Only. Under this alternative, KWSP 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, KWSP did not take any nontarget species from FY02 to FY06, 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 control methods and could lead to greater take of nontarget wildlife than the proposed action. For example, shooting by persons not proficient at bird identification could lead to killing of nontarget birds. It is hypothetically possible that frustration caused by the inability to reduce losses could lead to illegal use of chemical toxicants which could lead to unknown impacts on local nontarget species populations, including T&E species. Hazards to raptors, including Bald Eagles and falcons, could therefore be greater under this alternative if chemicals that are less selective or that cause secondary poisoning are used by frustrated private individuals. Therefore, it is likely that nontarget take under this alternative would be greater than under the proposed action and could include T&E and sensitive species.

4.1.2.3 Alternative 3 – KWSP Provides Technical Assistance Only for BDM. Alternative 3 would not allow KWSP to conduct any direct operational BDM in Kansas and, therefore, KWSP 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 control 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 KWSP 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 that cause secondary poisoning, leach into wetlands, and kill indiscriminately.

4.1.2.4 Alternative 4 - No Federal KWSP BDM. Alternative 4 would not allow KWSP to conduct any BDM in the State. Nontarget take by KWSP would be negated under this alternative. However, parties with bird damage problems would likely resort to other means of control such as use of shooting by private persons or even illegal use of chemical toxicants. There would be no impact on nontarget or T&E species by KWSP BDM activities from this alternative. However, private efforts to reduce or prevent depredations could increase which could result in less experienced persons implementing control 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, neither KWSP nor any other federal agency would provide assistance with BDM and, therefore, would not have an effect on nontarget, T&E, or sensitive species. USDA (1997) demonstrated that under the no federal program alternative, more nontarget animals would be affected. KDWP would likely provide some level of professional BDM assistance, but could be limited by resources (i.e., personnel, etc.) without federal assistance. Private efforts to reduce or prevent depredations would increase the most under this alternative. This would 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 SOPs to minimize nontarget take such as KWSP's self-imposed restrictions and policies to minimize or nullify nontarget take. As described in Sections 2.1.3 and 2.2.3, 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 KWSP, other agencies, or the public. Impacts can range from direct injury while implementing BDM methods to indirect impacts resulting from implementing BDM methods (e.g., impacts to water quality from chemicals used in BDM leaching into the system). Measures are often incorporated into BDM to minimize or nullify risks to the public, pets, and the environment. Various factors may, at times, preclude use of certain methods, so it is important to maintain the widest possible selection of BDM tools for resolving bird damage problems. However, the BDM methods used to resolve bird damage must be legal and biologically sound. Following is a discussion of the various impacts under the Alternatives.

4.1.3.1 Alternative 1 - Continue the Current Federal BDM Program. BDM methods that might raise safety concerns include the use of firearms, pyrotechnics for hazing, traps, cage traps, and chemical repellents, toxicants, drugs, and reproductive inhibitors. KWSP poses minimal threat to people, pets and the environment with BDM methods such as shooting, hazing with pyrotechnics, trapping, and use of chemicals (USDA 1997-Appendix P&Q). All firearm and pyrotechnic safety precautions are followed by KWSP when conducting BDM and KWSP complies with all applicable laws and regulations governing the lawful use of firearms. Shooting with shotguns or rifles is used to reduce bird damage when lethal methods are determined to be appropriate. Shooting is selective for target species. Firearms are only used by KWSP personnel who are experienced in handling and using them. Firearm use is very sensitive and a public concern because firearms can be misused. To ensure safe use and awareness, KWSP employees who use firearms to conduct official duties “will be provided safety and handling training as prescribed in the WS Firearms Safety Manual and continuing education training on firearms safety and handling will be taken biennially by all employees who use firearms.” (WS Directive 2.615). KWSP Specialists who use firearms as a condition of employment, are required to certify that they meet the criteria as stated in the Lautenberg Amendment. KWSP also follows safety precautions and WS Policies when using pyrotechnics. KWSP uses a variety of traps for birds such as decoy cage traps. These are strategically placed to minimize exposure to the public and pets. Appropriate signs are posted on all properties where traps are set to alert the public of their presence. KWSP 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 (USDA 1997, Appendix P). Therefore, no significant impact on human safety from WS’ use of non-chemical BDM methods is expected.

KWSP personnel that use avian toxicants are certified through KDA. Two toxicants are used in BDM, DRC-1339 and Avitrol®. Immobilization and euthanasia drugs are used only by KWSP personnel trained and certified to use them. KWSP personnel abide by WS policies and SOPs, and federal and state laws and regulations when using BDM methods that have potential risks. The same would apply to immunocontraceptives should they become registered for use in Kansas. USDA (1997) 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. KWSP used an average of about 23 pounds of DRC-1339 from FY02 to FY06 with a high of 44.4 pounds used in FY03.

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 (1997, Appendix Q) provides detailed information on this chemical and its use in BDM. Factors that virtually eliminate any risk of public health problems from use of this chemical are:

- Federal label and State law requires that the chemical be applied only by an individual trained and certified in its use; that the chemical be applied under strict guidelines in regard to suitable locations and bait materials to be used.

- DRC-1339 is highly unstable and degrades rapidly when exposed to sunlight, heat, or ultraviolet radiation. The half-life is about 25 hours, which means that the chemical on treated bait material generally is nearly 100% broken down within a week.

- The chemical is more than 90% metabolized in target birds within the first few hours after they ingest the bait. Therefore, little material is left in bird carcasses that may be found or retrieved by people.

- The application rates are extremely low (< 0.1 lb. of active ingredient per acre) (EPA 1995).

- People or pets would need to ingest the internal organs of birds found dead from DRC-1339 to have any chance of receiving even a minute amount of the chemical or its metabolites into his/her system. This is highly unlikely to occur for people, and pets generally could not eat enough dead birds to receive a lethal dose.

- EPA concluded that, based on mutagenicity (the tendency to cause gene mutations in cells) studies, this chemical is not a mutagen or a carcinogen (i.e., cancer-causing agent) (EPA 1995). Regardless, however, the extremely controlled and limited circumstances in which DRC-1339 is used would prevent any exposure of the public to this chemical.

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

Avitrol® (4-Aminopyridine). Avitrol® is another chemical method that is used by KWSP in BDM. KWSP used an average of almost 40 ounces of prepared bait materials from FY02 to FY06 with a high of 80 ounces (5 pounds) in FY04. Although this chemical was not identified as being one of concern for human health effects, analysis of the potential for adverse effects is presented here. USDA (1997, Appendix Q) provides more detailed information on this chemical.

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

- Federal label and State law requires that the chemical be applied only by an individual trained and certified in its use; that the chemical be applied under strict guidelines.

- It is readily broken down or metabolized into removable compounds that are excreted in urine in the target species (Extension Toxicology Network 1996). Therefore, little of the chemical remains in killed birds to present a hazard to humans.

- A human would need to ingest the internal organs of birds found dead from Avitrol® ingestion to have any chance of receiving even a minute amount of the chemical or its metabolites into his/her system. This is highly unlikely to occur. Furthermore, secondary hazard studies with mammals and birds have shown that there is virtually no hazard of secondary poisoning.

- Although Avitrol® has not been specifically tested as a cancer-causing agent, the chemical was found not to be mutagenic in bacterial organisms (EPA 1997). Therefore, the best scientific information available indicates it is not a carcinogen. Regardless, however, the extremely controlled and limited circumstances in which Avitrol® is used would prevent exposure of members of the public and pets to this chemical.

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

Other BDM Chemicals. Other nonlethal BDM chemicals that might be used or recommended by KWSP 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, nicarbazin (OvoControlTM G) reproductive inhibitor, and A-C (KWSP used an average of 4,200 mg AC from FY02 to FY06 with a high of 8,900 mg in FY06). 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 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. KWSP has only used A-C operationally from FY02 to FY06.

Based on a thorough Risk Assessment, APHIS concluded that, when WS program chemical methods are used in accordance with label directions, they are highly selective to target individuals or populations, and such use has negligible impacts on the environment (USDA 1997). KWSP did not have any incidents involving the public or pets conducting BDM from FY02 to FY06.

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

4.1.3.2 Alternative 2 - Nonlethal BDM by KWSP Only. Alternative 2 would not allow for any lethal methods use by KWSP. KWSP would only implement nonlethal methods such as harassment with shooting firearms and pyrotechnics, live traps, repellents (e.g., methiocarb, MA, and polybutene tactile repellents), tranquilizing drugs (A-C), 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 KWSP 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 KWSP'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 KWSP's assistance than under Alternative 1. Use of these chemicals in accordance with label requirements should avoid any hazard to members of the public. It is hypothetically possible that frustration caused by the inability to alleviate bird damage could lead to illegal use of certain methods such as toxicants that, unlike KWSP's controlled use of DRC-1339 and Avitrol®, could pose secondary poisoning hazards to pets and to mammalian and avian scavengers. Some chemicals that could be used illegally would present greater risks of adverse effects on humans than those used under the current program alternative.

4.1.3.3 Alternative 3 - KWSP Provides Technical Assistance Only for BDM. Alternative 3 would not allow any direct operational BDM assistance by KWSP in the State. KWSP 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 KWSP implementing BDM under this alternative would be nullified. Additionally, DRC-1339 and A-C are only registered for use by KWSP 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 KWSP, people, pets, and the environment may not be as at great a risk compared to persons using hazardous BDM methods with no instruction, similar to that discussed under Alternative 2. KDWP may provide some services and risks from BDM method use would be similar to the proposed action for projects they completed. Commercial pest control services would be able to use Avitrol® and such use would likely occur to a greater extent in the absence of KWSP'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 and 2.2.3, could lead to illegal use of certain toxicants that, unlike KWSP's controlled use of firearms, pyrotechnics, traps, and chemicals, could pose secondary poisoning hazards to pets and to mammalian and avian scavengers. Some chemicals that could be used illegally would present greater risks of adverse effects to humans and the environment, than those used under the Current Program Alternative. Therefore, risks to people, pets, and the environment would be expected to be greater under this alternative than the proposed action, but similar and possibly greater than Alternative 2. Risks, though, would be less than under Alternative 4.

4.1.3.4 Alternative 4 - No Federal KWSP BDM. Alternative 4 would not allow KWSP or any other federal agency to conduct BDM in the State. Therefore, concerns about risks to people, pets, and the environment from KWSP would be nullified. In addition, DRC-1339 and A-C, registered for use only for KWSP personnel, would not be available for use by private individuals. KDWP possibly could provide some level of professional BDM, and their actions and associated risks would be similar to Alternative 1. Private efforts to reduce or prevent damage would be expected to increase, resulting in less experienced persons implementing BDM methods and potentially leading to greater risks to people, pets, and the environment as has been described under the alternatives. Commercial pest control services would be able to use Avitrol® and other available pesticides and requests for such use would likely occur to a greater extent in the absence of KWSP's assistance. However, use of Avitrol® or other BDM chemicals in accordance with label requirements should avoid any hazard to members of the public. It is hypothetically possible that frustration caused by the inability to alleviate bird damage could lead to the use of illegal methods such as certain toxicants that could pose risks to people, pets, and the environment and these risks would likely be highest under this alternative compared to the other three. Therefore, BDM methods and their associated risks, and illegal activities would be greater under this alternative than under Alternatives 1, 2, and 3.

4.1.4 Effects of BDM on Aesthetics

Aesthetics is the philosophy dealing with the nature or appreciation of beauty. Therefore, aesthetics is truly subjective in nature and wholly dependent on what an observer regards as beautiful. On the one hand, birds are often regarded as being aesthetic. In addition, birds can provide economic and recreational benefits (Decker and Goff 1987), and the mere knowledge that they exist is a positive benefit to many people. Wildlife populations provide a range of social and economic benefits (Decker and Goff 1987). These include direct benefits related to consumptive and non-consumptive use (i.e. wildlife-related recreation, observation, harvest, sale), indirect benefits derived from vicarious wildlife related experiences (i.e., reading, television viewing), and the personal enjoyment of knowing wildlife exists and contributes to the stability of natural ecosystems (i.e., ecological, existence, bequest values) (Bishop 1987). These positive traits of wildlife generally become incorporated into their overall aesthetic value.

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

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

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

4.1.4.1 Alternative 1 - Continue the Current Federal BDM Program. Some people who routinely view or feed individual birds such as feral domestic pigeons or urban waterfowl would likely be disturbed by removal of such birds under the current program. KWSP 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, KWSP could selectively capture the target species (coots, ducks, geese, etc.) utilizing A-C or trapping without disturbing the other waterfowl species that are present and deemed enjoyable to the public. This strategy could also be utilized on individual birds that could be creating a damage problem. This type of consideration can help to mitigate adverse effects on local peoples' enjoyment of certain individual birds or groups of birds.

Some people have expressed opposition to the killing of any birds during BDM activities. Under the current program, lethal and nonlethal control of birds would continue and these persons would continue to be opposed. However, many persons who voice opposition have no direct connection or opportunity to view or enjoy the particular birds that would be killed by KWSP'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 KWSP's nonlethal bird harassment activities. Mitigating any such impact, however, is the fact that overall numbers of birds in the area would not be diminished by the harassment program and people who like to view these species could still do so on State wildlife management areas, National Wildlife Refuges, or on numerous private property sites where the owners are not experiencing damage to the birds and are tolerant of their presence.

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

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

4.1.4.2 Alternative 2 - Nonlethal BDM by KWSP Only. Under this alternative, KWSP 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 KWSP'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 KWSP which means the impacts would then be similar to the current program alternative.

Under this alternative, KWSP would be restricted to nonlethal methods only. Nuisance pigeon problems would have to be resolved by nonlethal barriers and exclusion methods. Assuming property owners would choose to allow and pay for the implementation of these types of methods, this alternative would result in nuisance pigeons and other birds relocating to other sites where they would likely cause or aggravate similar problems for other property owners. Thus, this alternative would most likely result in more property owners experiencing adverse effects on the aesthetic values of their properties than the current program alternative. Many of the current materials for used barriers (netting, metal flashing, wire, etc) could, in some cases, reduce the aesthetic property value.

4.1.4.3 Alternative 3 - KWSP Provides Technical Assistance Only for BDM. Under this alternative, KWSP would not conduct any direct operational BDM but would still provide technical assistance or self-help advice to persons requesting assistance with bird damage. KWSP 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 KWSP activities under this alternative because the individual birds would not be killed or harassed by KWSP. However, other private entities would likely conduct similar BDM activities as those that would no longer be conducted by KWSP which means the impacts would then be similar to the current program alternative.

Under this alternative, the lack of operational assistance in reducing nuisance pigeon and other bird problems would mean aesthetic values of some affected properties would continue to be adversely affected but this would not occur to as great a degree as under the No Program Alternative. This is because some of these property owners would be able to resolve their problems by following KWSP'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 KWSP has only provided technical assistance to local residents or municipal authorities, coordination with local authorities to monitor the birds' movements to assure the birds do not reestablish in other undesirable locations might not be conducted. In such cases, limiting KWSP to technical assistance only could result in a greater chance of adverse impacts on aesthetics of property owners at other locations than the current program alternative.

4.1.3.4 Alternative 4 - No Federal KWSP BDM. Under this alternative, KWSP 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 KWSP under this alternative. However, other private entities would likely conduct similar

BDM activities as those that would no longer be conducted by KWSP which means the impacts would then be similar to the current program alternative.

Under this alternative, the lack of any operational or technical assistance in reducing nuisance pigeon and other bird problems by KWSP 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

The environmental effects of implementing BDM correspond with those raised and discussed in detail in Chapter 4 of USDA (1997). Impacts associated with activities under consideration here 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, as described in USDA (1997), will not result in cumulatively significant environmental impacts. Monitoring the impacts of the program on the populations of both target and nontarget species will continue. All bird control activities that may take place will comply with relevant laws, regulations, policies, orders, and procedures, including the Endangered Species Act, Migratory Bird Treaty Act, and FIFRA. A summary of the overall effects of the BDM alternatives relative to the issues is given in Table 17. The current program alternative provides the lowest overall negative environmental consequences combined with the highest positive effects.

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

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

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

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

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APPENDIX A - Population estimates for the Central Flyway for species with more than an average of 10 taken lethally by KWSP in BDM.

Table A1. Red-winged Blackbird Breeding Bird Survey population estimate for the Central Flyway from surveys conducted in 2001 to 2005 (Sauer et al. 2006).

BBS Physiographic Region	Size (km^2)	Size (mi^2)	Ave Count 2001-2005	PIF Adjust	Est. Breeding Population
03 Coastal Flatwoods	12,660	4,888	4.87	9.04	21,519
04 Upper Coastal Plain	57,685	22,272	12.00	9.04	241,609
06 Coastal Prairies	45,348	17,509	115.21	9.04	1,823,545
07 South Texas Brushlands	86,369	33,347	118.98	9.04	3,586,742
08 East Texas Prairies	105,115	40,585	13.62	9.04	499,701
19 Ozark-Ouachita Plateau	20,987	8,103	16.93	9.04	124,015
30 Aspen Parklands	259,605	100,233	39.30	9.04	3,561,015
32 Dissected Till Plains	52,768	20,374	132.84	9.04	2,446,627
33 Osage Plains - Cross Timbers	125,146	48,319	40.84	9.04	1,783,902
34 High Plains Border	166,823	64,410	104.29	9.04	6,072,490
35 Rolling Red Prairies	90,164	34,812	65.23	9.04	2,052,810
36 High Plains	236,133	91,171	79.45	9.04	6,548,153
37 Drift Prairie	235,001	90,734	95.96	9.04	7,870,969
38 Glaciated Missouri Plateau	275,586	106,404	57.88	9.04	5,567,419
39 Great Plains Roughlands	369,965	142,843	44.15	9.04	5,701,112
40 Black Prairie	20,601	7,954	112.30	9.04	807,488
53 Edward’s Plateau	78,516	30,315	2.32	9.04	63,579
54 Rolling Red Plains	114,084	44,048	16.97	9.04	675,733
55 Staked Plains	129,818	50,123	63.07	9.04	2,857,761
61 Black Hills	14,751	5,695	20.81	9.04	107,142
Central Flyway South of BBS Northern Limit	2,497,125	964,140	54.36	9.04	52,413,332

Table A2. Brown-headed Cowbird Breeding Bird Survey population estimate for the Central Flyway from surveys conducted in 2001 to 2005 (Sauer et al. 2006).

BBS Physiographic Region	Size (km^2)	Size (mi^2)	Ave Count 2001-2005	PIF Adjust	Est. Breeding Population
03 Coastal Flatwoods	12,660	4,888	6.01	9.44	27,732
04 Upper Coastal Plain	57,685	22,272	14.77	9.44	310,538
06 Coastal Prairies	45,348	17,509	11.17	9.44	184,622
07 South Texas Brushlands	86,369	33,347	8.95	9.44	281,743
08 East Texas Prairies	105,115	40,585	16.52	9.44	632,917
19 Ozark-Ouachita Plateau	20,987	8,103	11.77	9.44	90,032
30 Aspen Parklands	259,605	100,233	12.23	9.44	1,157,208
32 Dissected Till Plains	52,768	20,374	9.63	9.44	185,212
33 Osage Plains - Cross Timbers	125,146	48,319	21.10	9.44	962,435
34 High Plains Border	166,823	64,410	23.04	9.44	1,400,910
35 Rolling Red Prairies	90,164	34,812	40.29	9.44	1,324,043
36 High Plains	236,133	91,171	44.08	9.44	3,793,762
37 Drift Prairie	235,001	90,734	9.21	9.44	788,862
38 Glaciated Missouri Plateau	275,586	106,404	33.66	9.44	3,380,984
39 Great Plains Roughlands	369,965	142,843	32.10	9.44	4,328,500
40 Black Prairie	20,601	7,954	30.09	9.44	225,934
53 Edward’s Plateau	78,516	30,315	17.07	9.44	488,499
54 Rolling Red Plains	114,084	44,048	7.09	9.44	294,810
55 Staked Plains	129,818	50,123	1.72	9.44	81,383
61 Black Hills	14,751	5,695	7.97	9.44	42,850
Central Flyway South of BBS Northern Limit	2,497,125	964,140	20.73	9.44	19,982,976

Table A3. Common Grackle Breeding Bird Survey population estimate for the Central Flyway from surveys conducted in 2001 to 2005 (Sauer et al. 2006).

BBS Physiographic Region	Size (km^2)	Size (mi^2)	Ave Count 2001-2005	PIF Adjust	Est. Breeding Population
03 Coastal Flatwoods	12,660	4,888	22.72	11.12	123,494
04 Upper Coastal Plain	57,685	22,272	22.20	11.12	549,820
06 Coastal Prairies	45,348	17,509	23.88	11.12	464,940
07 South Texas Brushlands	86,369	33,347	2.69	11.12	99,750
08 East Texas Prairies	105,115	40,585	11.03	11.12	497,788
19 Ozark-Ouachita Plateau	20,987	8,103	9.62	11.12	86,682
30 Aspen Parklands	259,605	100,233	1.31	11.12	146,012
32 Dissected Till Plains	52,768	20,374	57.29	11.12	1,297,938
33 Osage Plains - Cross Timbers	125,146	48,319	17.62	11.12	946,733
34 High Plains Border	166,823	64,410	52.36	11.12	3,750,249
35 Rolling Red Prairies	90,164	34,812	23.46	11.12	908,167
36 High Plains	236,133	91,171	38.79	11.12	3,932,612
37 Drift Prairie	235,001	90,734	24.66	11.12	2,488,097
38 Glaciated Missouri Plateau	275,586	106,404	13.82	11.12	1,635,196
39 Great Plains Roughlands	369,965	142,843	8.10	11.12	1,286,620
40 Black Prairie	20,601	7,954	66.76	11.12	590,485
53 Edward’s Plateau	78,516	30,315	2.56	11.12	86,298
54 Rolling Red Plains	114,084	44,048	12.58	11.12	616,183
55 Staked Plains	129,818	50,123	6.94	11.12	386,811
61 Black Hills	14,751	5,695	2.20	11.12	13,933
Central Flyway South of BBS Northern Limit	2,497,125	964,140	20.65	11.12	19,907,811

Table A4. Brewer’s Blackbird Breeding Bird Survey population estimate for the Central Flyway from surveys conducted in 2001 to 2005 (Sauer et al. 2006).

BBS Physiographic Region	Size (km^2)	Size (mi^2)	Ave Count 2001-2005	PIF Adjust	Est. Breeding Population
03 Coastal Flatwoods	12,660	4,888	0	9.84	0
04 Upper Coastal Plain	57,685	22,272	0	9.84	0
06 Coastal Prairies	45,348	17,509	0	9.84	0
07 South Texas Brushlands	86,369	33,347	0	9.84	0
08 East Texas Prairies	105,115	40,585	0	9.84	0
19 Ozark-Ouachita Plateau	20,987	8,103	0	9.84	0
30 Aspen Parklands	259,605	100,233	10.57	9.84	1,042,517
32 Dissected Till Plains	52,768	20,374	0	9.84	0
33 Osage Plains - Cross Timbers	125,146	48,319	0	9.84	0
34 High Plains Border	166,823	64,410	0	9.84	0
35 Rolling Red Prairies	90,164	34,812	0	9.84	0
36 High Plains	236,133	91,171	2.44	9.84	218,898
37 Drift Prairie	235,001	90,734	17.66	9.84	1,576,723
38 Glaciated Missouri Plateau	275,586	106,404	18.02	9.84	1,886,717
39 Great Plains Roughlands	369,965	142,843	8.95	9.84	1,257,994
40 Black Prairie	20,601	7,954	6.93	9.84	54,240
53 Edward’s Plateau	78,516	30,315	0	9.84	0
54 Rolling Red Plains	114,084	44,048	0	9.84	0
55 Staked Plains	129,818	50,123	0	9.84	0
61 Black Hills	14,751	5,695	7.08	9.84	39,678
Central Flyway South of BBS Northern Limit	2,497,125	964,140	6.30	9.84	6,076,766

Table A5. Great-tailed Grackle Breeding Bird Survey population estimate for the Central Flyway from surveys conducted in 2001 to 2005 (Sauer et al. 2006).

BBS Physiographic Region	Size (km^2)	Size (mi^2)	Ave Count 2001-2005	PIF Adjust	Est. Breeding Population
03 Coastal Flatwoods	12,660	4,888	0	10.56	0
04 Upper Coastal Plain	57,685	22,272	0.04	10.56	941
06 Coastal Prairies	45,348	17,509	17.62	10.56	325,783
07 South Texas Brushlands	86,369	33,347	183.42	10.56	6,459,045
08 East Texas Prairies	105,115	40,585	6.51	10.56	279,003
19 Ozark-Ouachita Plateau	20,987	8,103	0.08	10.56	685
30 Aspen Parklands	259,605	100,233	0	10.56	0
32 Dissected Till Plains	52,768	20,374	2.15	10.56	46,257
33 Osage Plains - Cross Timbers	125,146	48,319	4.11	10.56	209,712
34 High Plains Border	166,823	64,410	0.38	10.56	25,847
35 Rolling Red Prairies	90,164	34,812	2.66	10.56	97,786
36 High Plains	236,133	91,171	8.34	10.56	802,946
37 Drift Prairie	235,001	90,734	0	10.56	0
38 Glaciated Missouri Plateau	275,586	106,404	0	10.56	0
39 Great Plains Roughlands	369,965	142,843	0	10.56	0
40 Black Prairie	20,601	7,954	0	10.56	0
53 Edward's Plateau	78,516	30,315	6.34	10.56	202,960
54 Rolling Red Plains	114,084	44,048	21.78	10.56	1,013,086
55 Staked Plains	129,818	50,123	66.81	10.56	3,536,227
61 Black Hills	14,751	5,695	0	10.56	0
Central Flyway South of BBS Northern Limit	2,497,125	964,140	13.48	10.56	13,000,277

Table A6. Yellow-headed Blackbird Breeding Bird Survey population estimate for the Central Flyway from surveys conducted in 2001 to 2005 (Sauer et al. 2006).

BBS Physiographic Region	Size (km^2)	Size (mi^2)	Ave Count 2001-2005	PIF Adjust	Est. Breeding Population
03 Coastal Flatwoods	12,660	4,888	0	11.60	0
04 Upper Coastal Plain	57,685	22,272	0	11.60	0
06 Coastal Prairies	45,348	17,509	0	11.60	0
07 South Texas Brushlands	86,369	33,347	0	11.60	0
08 East Texas Prairies	105,115	40,585	0	11.60	0
19 Ozark-Ouachita Plateau	20,987	8,103	0	11.60	0
30 Aspen Parklands	259,605	100,233	5.22	11.60	606,934
32 Dissected Till Plains	52,768	20,374	0.15	11.60	3,545
33 Osage Plains - Cross Timbers	125,146	48,319	0	11.60	0
34 High Plains Border	166,823	64,410	0	11.60	0
35 Rolling Red Prairies	90,164	34,812	0	11.60	0
36 High Plains	236,133	91,171	3.09	11.60	326,793
37 Drift Prairie	235,001	90,734	37.01	11.60	3,895,351
38 Glaciated Missouri Plateau	275,586	106,404	28.39	11.60	3,504,131
39 Great Plains Roughlands	369,965	142,843	2.37	11.60	392,705
40 Black Prairie	20,601	7,954	9.22	11.60	85,070
53 Edward's Plateau	78,516	30,315	0	11.60	0
54 Rolling Red Plains	114,084	44,048	0	11.60	0
55 Staked Plains	129,818	50,123	0	11.60	0
61 Black Hills	14,751	5,695	0	11.60	0
Central Flyway South of BBS Northern Limit	2,497,125	964,140	9.14	11.60	8,814,529

Table A7. Mallard Breeding Bird Survey population estimate for the Central Flyway from surveys conducted in 2001 to 2005 (Sauer et al. 2006).

BBS Physiographic Region	Size (km^2)	Size (mi^2)	Ave Count 2001-2005	PIF Adjust	Est. Breeding Population
03 Coastal Flatwoods	12,660	4,888	0.21	5.00	513
04 Upper Coastal Plain	57,685	22,272	0.52	5.00	5,791
06 Coastal Prairies	45,348	17,509	0	5.00	0
07 South Texas Brushlands	86,369	33,347	0	5.00	0
08 East Texas Prairies	105,115	40,585	0	5.00	0
19 Ozark-Ouachita Plateau	20,987	8,103	0	5.00	0
30 Aspen Parklands	259,605	100,233	17.49	5.00	876,542
32 Dissected Till Plains	52,768	20,374	0.79	5.00	8,048
33 Osage Plains - Cross Timbers	125,146	48,319	0	5.00	0
34 High Plains Border	166,823	64,410	1.90	5.00	61,190
35 Rolling Red Prairies	90,164	34,812	1.00	5.00	17,406
36 High Plains	236,133	91,171	4.20	5.00	191,459
37 Drift Prairie	235,001	90,734	25.75	5.00	1,168,199
38 Glaciated Missouri Plateau	275,586	106,404	19.55	5.00	1,040,097
39 Great Plains Roughlands	369,965	142,843	3.51	5.00	250,690
40 Black Prairie	20,601	7,954	10.75	5.00	42,753
53 Edward’s Plateau	78,516	30,315	0	5.00	0
54 Rolling Red Plains	114,084	44,048	0.12	5.00	2,643
55 Staked Plains	129,818	50,123	4.47	5.00	112,024
61 Black Hills	14,751	5,695	1.01	5.00	2,876
Central Flyway South of BBS Northern Limit	2,497,125	964,140	3.92	5.00	3,780,231

Table A8. Cattle Egret Breeding Bird Survey population estimate for the Central Flyway from surveys conducted in 2001 to 2005 (Sauer et al. 2006).

BBS Physiographic Region	Size (km^2)	Size (mi^2)	Ave Count 2001-2005	PIF Adjust	Est. Breeding Population
03 Coastal Flatwoods	12,660	4,888	8.82	5.00	21,556
04 Upper Coastal Plain	57,685	22,272	11.90	5.00	132,519
06 Coastal Prairies	45,348	17,509	87.50	5.00	766,013
07 South Texas Brushlands	86,369	33,347	9.17	5.00	152,896
08 East Texas Prairies	105,115	40,585	66.70	5.00	1,353,506
19 Ozark-Ouachita Plateau	20,987	8,103	1.34	5.00	5,429
30 Aspen Parklands	259,605	100,233	0	5.00	0
32 Dissected Till Plains	52,768	20,374	0	5.00	0
33 Osage Plains - Cross Timbers	125,146	48,319	10.27	5.00	248,117
34 High Plains Border	166,823	64,410	0	5.00	0
35 Rolling Red Prairies	90,164	34,812	8.76	5.00	152,478
36 High Plains	236,133	91,171	0	5.00	0
37 Drift Prairie	235,001	90,734	0	5.00	0
38 Glaciated Missouri Plateau	275,586	106,404	0.84	5.00	44,690
39 Great Plains Roughlands	369,965	142,843	0	5.00	0
40 Black Prairie	20,601	7,954	0	5.00	0
53 Edward’s Plateau	78,516	30,315	0	5.00	0
54 Rolling Red Plains	114,084	44,048	3.94	5.00	86,774
55 Staked Plains	129,818	50,123	0	5.00	0
61 Black Hills	14,751	5,695	0	5.00	0
Central Flyway South of BBS Northern Limit	2,497,125	964,140	3.07	5.00	2,963,979

Table A9. Ring-billed Gull Breeding Bird Survey population estimate for the Central Flyway from surveys conducted in 2001 to 2005 (Sauer et al. 2006).

BBS Physiographic Region	Size (km^2)	Size (mi^2)	Ave Count 2001-2005	PIF Adjust	Est. Breeding Population
03 Coastal Flatwoods	12,660	4,888	0	5.00	0
04 Upper Coastal Plain	57,685	22,272	0	5.00	0
06 Coastal Prairies	45,348	17,509	0	5.00	0
07 South Texas Brushlands	86,369	33,347	0	5.00	0
08 East Texas Prairies	105,115	40,585	0	5.00	0
19 Ozark-Ouachita Plateau	20,987	8,103	0	5.00	0
30 Aspen Parklands	259,605	100,233	13.21	5.00	662,042
32 Dissected Till Plains	52,768	20,374	0	5.00	0
33 Osage Plains - Cross Timbers	125,146	48,319	0	5.00	0
34 High Plains Border	166,823	64,410	0	5.00	0
35 Rolling Red Prairies	90,164	34,812	0	5.00	0
36 High Plains	236,133	91,171	0	5.00	0
37 Drift Prairie	235,001	90,734	6.87	5.00	311,671
38 Glaciated Missouri Plateau	275,586	106,404	17.76	5.00	944,865
39 Great Plains Roughlands	369,965	142,843	0.17	5.00	12,142
40 Black Prairie	20,601	7,954	3.70	5.00	14,715
53 Edward's Plateau	78,516	30,315	0	5.00	0
54 Rolling Red Plains	114,084	44,048	0	5.00	0
55 Staked Plains	129,818	50,123	0	5.00	0
61 Black Hills	14,751	5,695	0	5.00	0
Central Flyway South of BBS Northern Limit	2,497,125	964,140	2.02	5.00	1,945,435

Table A10. Mourning Dove Breeding Bird Survey population estimate for the Central Flyway from surveys conducted in 2001 to 2005 (Sauer et al. 2006).

BBS Physiographic Region	Size (km^2)	Size (mi^2)	Ave Count 2001-2005	PIF Adjust	Est. Breeding Population
03 Coastal Flatwoods	12,660	4,888	24.76	10.48	126,837
04 Upper Coastal Plain	57,685	22,272	30.47	10.48	711,208
06 Coastal Prairies	45,348	17,509	36.03	10.48	661,125
07 South Texas Brushlands	86,369	33,347	62.36	10.48	2,179,340
08 East Texas Prairies	105,115	40,585	46.47	10.48	1,976,507
19 Ozark-Ouachita Plateau	20,987	8,103	13.62	10.48	115,661
30 Aspen Parklands	259,605	100,233	5.81	10.48	610,310
32 Dissected Till Plains	52,768	20,374	43.22	10.48	922,819
33 Osage Plains - Cross Timbers	125,146	48,319	39.10	10.48	1,979,953
34 High Plains Border	166,823	64,410	104.95	10.48	7,084,341
35 Rolling Red Prairies	90,164	34,812	71.66	10.48	2,614,394
36 High Plains	236,133	91,171	92.15	10.48	8,804,671
37 Drift Prairie	235,001	90,734	17.95	10.48	1,706,850
38 Glaciated Missouri Plateau	275,586	106,404	19.04	10.48	2,123,172
39 Great Plains Roughlands	369,965	142,843	33.11	10.48	4,956,566
40 Black Prairie	20,601	7,954	29.12	10.48	242,740
53 Edward's Plateau	78,516	30,315	42.63	10.48	1,354,361
54 Rolling Red Plains	114,084	44,048	40.09	10.48	1,850,640
55 Staked Plains	129,818	50,123	61.54	10.48	3,232,611
61 Black Hills	14,751	5,695	5.80	10.48	34,619
Central Flyway South of BBS Northern Limit	2,497,125	964,140	44.90	10.48	43,288,724

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

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

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

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

WS also targets blackbirds in the family Icteridae in the Central Flyway and Kansas at feedlots, rice fields, and other resource areas. 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 similar to those determined in Table 1. Estimates in Table 1 included an assumed 10% wastage loss which would make the estimates very close to those found by researchers. The predicted take estimates from Table 1 will be used to calculate the of each species taken in Table 3.

KWSP in Kansas also targets feral pigeons with DRC-1339. WS uses whole kernel corn for these projects, per label directions, cut at 1 treated:5 untreated (sometimes 1:2). Pigeons have to consume at least 4 treated kernels to get a lethal dose. The standard average number of whole corn kernels in a pound is 1,300 (Ontario Corn Producer Association 2007), but this is variable depending on variety of corn (1,600 by J. Homan, NWRC Bismarck, ND, pers. comm. 2007 and 1,700 by M. Marlow, Okla. WS, pers. comm. 2007). However, lower or higher weights for kernels would not change the outcome. Assuming that 1,300 kernels equals one pound and are treated, each kernel would have about 3.5 mg DRC-1339 (prior to being cut with untreated baits). The oral 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; KWSP 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 used by KWSP in BDM for House Sparrows, starlings, pigeons, and blackbirds in Kansas and other Central Flyway States, and comes prepackaged by the pound formulated at 0.5% 4-aminopyridine (the active ingredient) on mixed grain or corn chops. KWSP 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 (KWSP almost always cuts treated baits at the suggested 1:9 ratio, but this can be lowered to 1:5 for House Sparrows), and precipitation. KWSP uses mostly the mixed grain bait, but also uses some corn chops. The number of grain particles per pound varies by type and size of the bait, but would likely be from 6,000 to 23,000 particles per pound for mixed grain and cracked corn. Cracked corn sifted for particle sizes between 40mg to 50mg result in about 9,000 to 12,000 particles per pound (between #5 and #7 U.S. Standard Sieves). House Sparrows eat at least 6 grams of feed per day based on kilocalorie requirements of 20 to 28Kcal/day assuming that 3.5 Kcal are produced from a gram of grain (Cabe 1993). Starlings, with a high caloric diet, eat on average 23 grams/day (Twedt 1985) and pigeons likely require about 36 grams of feed per day (British Columbia Ministry of Environment 2001). Assuming that these 3 species eat at least 25% of the necessary daily intake at one feeding before other individuals react to the Avitrol® (House Sparrows and starlings, especially, would likely stop feeding after a few individuals reacted to the chemical because of their vocalizations), that the bait is mixed at 1 treated:9 untreated which is KWSP'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. These estimates will be used to determine impacts.

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).

In States where WS used DRC-1339 and Avitrol®, the percentage of starlings at feedlots was estimated by the WS Specialists. The following starling percentages for the MIS "Mixed Blackbirds" was determined by WS Specialists at feedlots that were treated. Their percentages will be used for feedlot work in the Central Flyway with Kansas, Nebraska, Oklahoma, and Texas having an estimated 95% starlings, Colorado at 85%, and New Mexico at 40% with the remaining percentages distributed to blackbird percentages found in the states at different times of the year. Homan (NWRC, pers. comm. 2007) stated that during his research in Kansas, starling flocks in feedlots constituted 99% or more of the birds in feedlots with few other species ever present. He also stated that a graduate student trapping birds in feedlots in the winter and spring of 2006-2007 caught no other birds besides starlings in traps. Thus, an estimate of 95% would be considered conservative for blackbird species, but believed to be within reason for starlings. However, to even make blackbird take more conservative for the analysis in the EA, the estimated WS Specialist observation blackbird percentages will be doubled to 10% in Kansas, Nebraska, Oklahoma, and Texas and to 30% in Colorado, but New Mexico's percentage will increase to 80% (half the number of starlings). We believe that the numbers estimated in Table 3 are already conservative estimates and will be used for the take Tables. However, the increased percentages of blackbirds will be considered in the EA.

Table 2. Composition of blackbirds in the Central Flyway in States where WS took "Mixed Blackbirds" with chemical toxicants. Starlings accounted for most work conducted at feedlots and their percentage was estimated by WS field personnel. The species composition for Texas rice growing areas was separated out because it is a smaller specific area with the potential of taking a couple additional species.

State	Species	BBS ave 01-05	BBS %	CBC Total 01/02-05/06	CBC %	Winter Factor	BBS/CBC ave	Migrating Factor
Kansas	RWBB	139.10	59.94%	22,569,420	98.63%	4.932%	79.29%	3.964%
	BRBB	0	0.00%	29,694	0.13%	0.006%	0.06%	0.003%
	YHBB	0	0.00%	15	0.00%	0.000%	0.00%	0.000%
	RUBB	0	0.00%	2,388	0.01%	0.001%	0.01%	0.000%
	CGRK	48.34	20.83%	128,154	0.56%	0.028%	10.70%	0.535%
	GGRK	2.10	0.91%	31,274	0.14%	0.007%	0.52%	0.026%
	BHCB	42.51	18.32%	121,423	0.53%	0.027%	9.43%	0.471%
Total		232.05	100.00%	22,882,369	100.00%	5.000%	100.00%	5.000%
Nebraska	RWBB	68.72	45.41%	18,177	98.28%	4.914%	71.84%	3.592%
	BRBB	0	0.00%	42	0.23%	0.011%	0.11%	0.006%
	YHBB	5.34	3.53%	11	0.06%	0.003%	1.79%	0.090%
	RUBB	0	0.00%	43	0.23%	0.012%	0.12%	0.006%
	CGRK	51.34	33.92%	76	0.41%	0.021%	17.17%	0.858%
	GGRK	0	0.00%	11	0.06%	0.003%	0.03%	0.001%
	BHCB	25.94	17.14%	136	0.74%	0.037%	8.94%	0.447%
Total		151.34	100.00%	18,496	100.00%	5.000%	100.00%	5.000%
E. New Mexico	RWBB	63.07	45.52%	5,921	89.68%	53.811%	67.60%	40.563%
	BRBB	0	0.00%	4	0.06%	0.036%	0.03%	0.018%
	RUBB	0	0.00%	1	0.02%	0.009%	0.01%	0.005%
	CGRK	6.94	5.01%	7	0.11%	0.064%	2.56%	1.535%
	GGRK	66.81	48.22%	118	1.79%	1.072%	25.01%	15.004%
	BHCB	1.72	1.24%	551	8.35%	5.008%	4.79%	2.876%
Total		138.54	100.00%	6,602	100.00%	60.000%	100.00%	60.000%
Oklahoma	RWBB	28.54	47.60%	1,114,052	88.18%	4.409%	67.89%	3.395%
	BRBB	0	0.00%	32,052	2.54%	0.127%	1.27%	0.063%
	RUBB	0	0.00%	4,022	0.32%	0.016%	0.16%	0.008%
	CGRK	10.44	17.41%	94,927	7.51%	0.376%	12.46%	0.623%
	GGRK	2.23	3.72%	9,074	0.72%	0.036%	2.22%	0.111%
	BHCB	18.75	31.27%	9,226	0.73%	0.037%	16.00%	0.800%
Total		59.96	100.00%	1,263,353	100.00%	5.000%	100.00%	5.000%
SE Texas (BBS phys. areas 3&6 combined)	RWBB	120.08	52.06%	1,098,574	52.038%		52.048%	
	BRBB	0	0.00%	54,163	2.566%		1.283%	
	YHBB	0	0.00%	3	0.000%		0.000%	
RICE	RUBB	0	0.00%	79	0.004%		0.002%	

	CGRK	46.60	20.20%	414,837	19.650%		19.926%	
	GGRK	17.61	7.63%	54,665	2.589%		5.112%	
	BGRK	29.20	12.66%	1,514	0.072%		6.365%	
	BHCB	17.18	7.45%	487,001	23.069%		15.258%	
	BRCB	0	0.00%	244	0.012%		0.006%	
Total		230.67	100.00%	2,111,080	100.000%		100.000%	
Texas	RWBB	42.25	38.84%	1,922,806	14.20%	0.710%	26.52%	1.326%
	BRBB	0	0.00%	413,843	3.06%	0.153%	1.53%	0.076%
	YHBB	0	0.00%	20,616	0.15%	0.008%	0.08%	0.004%
	RUBB	0	0.00%	2,054	0.02%	0.001%	0.01%	0.000%
	CGRK	9.13	8.39%	1,427,502	10.54%	0.527%	9.47%	0.473%
	GGRK	37.07	34.07%	1,110,052	8.20%	0.410%	21.14%	1.057%
	BGRK	6.51	5.98%	55,760	0.41%	0.021%	3.20%	0.160%
	BHCB	10.25	9.42%	8,559,567	63.20%	3.160%	36.31%	1.815%
	BRCB	3.58	3.29%	32,437	0.24%	0.012%	1.77%	0.088%
Total		108.79	100.00%	13,544,637	100.00%	5.000%	100.00%	5.000%

Under the “Mixed Blackbird” category, the species composition of blackbirds taken in control operations will be calculated using the species composition from USGS Breeding Bird Survey (BBS) data averaged with NAS Christmas Bird Count (CBC) data for projects occurring from April 1 to November 30, and from CBC data for projects occurring from December 1 to March 31. Projects protecting rice growers in Texas will be estimated using blackbird (excluding starlings) composition from BBS and CBC data for the same time in the southeastern rice growing belt of Texas. Starlings have rarely been seen feeding on treated rice bait plots and, therefore, will be assumed not to be taken during such operations. As discussed above, starlings are more likely to be feeding on insects and not on grains, unless insects are not available. Tables 2 provides the percentages used for blackbird species (excluding starlings) for estimating take with toxicants.

Once the information above was calculated, the WS take of birds with toxicants in the Central Flyway can be estimated. For feral pigeons, starlings, and House Sparrows only the take in Kansas is being considered in the EA and, thus, information for these species is only given for Kansas. It should be noted that a higher estimate was made for Yellow-headed Blackbirds with a third the percentage of birds found in Nebraska for Kansas and Oklahoma, because these percentages were estimated to be zero from bird surveys. The migratory percentage (ave. between BBS and CBC) was also increased for Texas because this was low. The CBC and BBS counts miss the migration of Yellow-headed Blackbirds through these states from northern breeding areas because of the timing of these counts (BBS=May-June, CBC=December-January). A few projects occur while these birds are migrating from July to September, but their migration is fairly quick with only a few birds lingering between breeding (northern parts of the Central Flyway) and wintering grounds (in Mexico from the Texas border south). The percentages of Yellow-headed Blackbirds in rice producing areas of Texas were found to be zero. However, projects to protect rice were excluded because few Yellow-headed Blackbirds are found in that area of Texas even during migration.

Table 3. Estimated take of birds in Kansas with chemical and other methods, and the Central Flyway for species being analyzed in the EA at that level.

State- Method	**ChFY02**	**ChFY03**	**ChFY04**	**ChFY05**	**ChFY06**	**%**	**Take/g or/oz**	**FY02**	**FY03**	**FY04**	**FY05**	**FY06**
(w-winter, m-migr)	**Use of DRC-1339 (g), Avitrol (oz)**							**Estimated Take**				
European Starling												
KS DRC-1339	1,724	14,220	9,979	5,103	7,258	100%	76	131,024	1,080,720	758,404	387,828	551,608
KS DRC Mix BB	2,386	5,897	1,361	1,746	1,814	95%	76	172,269	425,763	98,264	126,061	130,971
KS Avitrol	-	-	-	44	20	100%	44	-	-	-	1,936	880

KS Other Methods								88	145	2,496	3,802	3,225
TOTAL KS								303,381	1,506,628	859,164	519,627	686,684
Feral Pigeon												
KS DRC-1339	34	17	-	3	34	100%	40	1,360	680	0	120	1,360
KS Avitrol	-	-	-	23	7	100%	28	-	-	-	644	196
KS Other Methods								1,005	1,193	995	1,294	1,612
TOTAL KS								2,365	1,873	995	2,058	3,168
House Sparrow												
KS Avitrol	-	20	60	13	9	100%	170	0	3,400	10,200	2,210	1,530
KS Other								-	4	9	15	31
TOTAL KS								0	3,404	10,209	2,225	1,561
Red-winged Blackbird												
KS DRC (w)	1,706	3,175	454	839	0	4.932%	355	29,870	55,590	7,949	14,690	0
KS DRC (m)	680	2,722	907	907	1,814	3.964%	355	9,569	38,305	12,763	12,763	25,527
NE DRC (w)	46	0	0	0	0	4.914%	355	802	0	0	0	0
NM DRC (w)	0	46	0	0	0	53.811%	355	0	8,787	0	0	0
OK DRC (w)	60	0	46	0	18	4.409%	355	939	0	720	0	288
TX feed DRC (w)	907	0	91	0	101	0.710%	355	2,286	0	229	0	255
TX feed DRC (m)	36	0	0	23	0	1.326%	355	169	0	0	108	0
TX DRC (feed)	0	0	0	0	39	100.000	355	0	0	0	0	13,845
TX rice DRC (w)	1,007	802	572	942	593	52.038%	840	440,179	350,570	250,032	411,766	259,212
TX rice DRC (m)	0	28	0	0	0	52.048%	840	0	12,242	0	0	0
TX Avitrol (w)	0	0	80	0	0	0.710%	185	0	0	105	0	0
TX Avitrol (m)	0	0	0	0	16	1.326%	185	0	0	0	0	39
KS Other (w)	0	0	220	875	0	4.932%		0	0	11	43	0
KS Other (m)	0	0	95	293	0	3.964%		0	0	4	12	0
NE Other (m)	24	14	0	0	0	3.592%		1	1	0	0	0
OK Other (w)	679	971	46	0	10	4.409%		30	43	2	0	0
OK Other (m)	2,019	2,878	2,094	859	66	3.395%		69	98	71	29	2
TX Other (m)	13	0	0	13	0	1.326%		0	0	0	0	0
TOTAL RED-WINGED BLACKBIRD TAKE BY WS IN THE CENTRAL FLYWAY								483,914	465,634	271,887	439,412	299,168
KANSAS TOTAL								39,439	93,894	20,727	27,508	25,527
OTHER WS CENTRAL FLYWAY TOTAL - not including Kansas								444,476	371,740	251,160	411,904	273,641
TOTAL FOR INCREASED PERCENTAGES (10% in KS, NE, OK, TX, 30% in CO, 80% in NM)								527,650	562,598	293,846	467,057	311,435
Brown-headed Cowbird												
KS DRC (w)	1,706	3,175	454	839	0	0.027%	434	200	372	53	98	0
KS DRC (m)	680	2,722	907	907	1,814	0.471%	434	1,390	5,564	1,854	1,854	3,708
KS BHCB all	0	0	0	0	227	100%	434	0	0	0	0	98,518
NE DRC (w)	46	0	0	0	0	0.037%	434	7	0	0	0	0
NM DRC (w)	0	46	0	0	0	5.008%	434	0	1,000	0	0	0
OK DRC (w)	60	0	46	0	18	0.037%	434	10	0	7	0	3
OK BHCB all	0	0	0	0	14	100%	434	0	0	0	0	6,076
TX feed DRC (w)	907	0	91	0	101	3.160%	434	12,439	0	1,248	0	1,385
TX feed DRC (m)	36	0	0	23	0	1.815%	434	284	0	0	181	0
TX DRC all	0	0	0	0	81	100%	434	0	0	0	0	35,154
TX rice DRC (w)	1,007	802	572	942	593	23.069%	1,027	238,577	190,009	135,517	223,177	140,493
TX rice DRC (m)	0	28	0	0	0	15.258%	1,027	0	4,388	0	0	0
TX Avitrol (w)	0	0	80	0	0	3.160%	226	0	0	571	0	0
TX Avitrol (m)	0	0	0	0	16	1.815%	226	0	0	0	0	66

KS Other (w)	0	0	220	875	0	0.027%		0	0	0	0	0
KS Other (m)	0	0	95	293	0	0.471%		0	0	0	1	0
NE Other (m)	24	14	0	0	0	0.037%		0	0	0	0	0
OK Other (w)	679	971	46	0	10	0.037%		0	0	0	0	0
OK Other (m)	2,019	2,878	2,094	859	66	0.800%		16	23	17	7	1
TX Other (m)	13	0	0	13	0	1.815%		0	0	0	0	0
Other take KS	Other take included decoy cage traps and shooting							1,983	0	4	0	0
Other take NE								35	64	0	24	10
Other take OK								1,317	318	225	0	0
Other take TX								12,221	0	0	50	0
TOTAL BROWN-HEADED COWBIRD TAKE BY WS IN THE CENTRAL FLYWAY								268,479	201,738	139,498	225,394	285,413
KANSAS TOTAL								3,573	5,936	1,912	1,954	102,226
OTHER WS CENTRAL FLYWAY TOTAL - not including Kansas								264,906	195,802	137,586	223,440	183,187
TOTAL FOR INCREASED PERCENTAGES (10% in KS, NE, OK, TX, 30% in CO, 80% in NM)								282,825	208,030	143,249	227,536	239,363
Common Grackle												
KS DRC (w)	1,706	3,175	454	839	0	0.028%	197	94	175	25	46	0
KS DRC (m)	680	2,722	907	907	1,814	0.535%	197	717	2,869	956	956	1,912
NE DRC (w)	46	0	0	0	0	0.021%	197	2	0	0	0	0
NM DRC (w)	0	46	0	0	0	0.064%	197	0	6	0	0	0
OK DRC (w)	60	0	46	0	18	0.376%	197	44	0	34	0	14
OK CGRK all	0	37	59	42	46	100%	197	0	7,289	11,623	8,274	9,062
TX feed DRC (w)	907	0	91	0	101	0.527%	197	942	0	94	0	105
TX feed DRC (m)	36	0	0	23	0	0.473%	197	34	0	0	21	0
TX DRC CGRK all	36	19	11	0	0	100%	197	7,092	3,743	2,167	0	0
TX rice DRC (w)	1,007	802	572	942	593	19.650%	513	101,510	80,845	57,660	94,958	59,777
TX rice DRC (m)	0	28	0	0	0	19.926%	513	0	2,862	0	0	0
TX Avitrol (w)	0	0	80	0	0	0.527%	113	0	0	48	0	0
TX Avitrol (m)	0	0	0	0	16	0.473%	113	0	0	0	0	9
KS Other (w)	0	0	220	875	0	0.028%		0	0	0	0	0
KS Other (m)	0	0	95	293	0	0.535%		0	0	1	2	0
NE Other (m)	24	14	0	0	0	0.858%		0	0	0	0	0
OK Other (w)	679	971	46	0	10	0.376%		3	4	0	0	0
OK Other (m)	2,019	2,878	2,094	859	66	0.623%		13	18	13	5	0
TX Other (m)	13	0	0	13	0	0.473%		0	0	0	0	0
Other take KS	Other take included decoy cage traps and shooting							0	26	0	8	0
Other take NE								6	20	0	80	84
Other take OK								14	92	1	459	402
Other take TX								6	0	31	135	2
TOTAL COMMON GRACKLE TAKE BY WS IN THE CENTRAL FLYWAY								110,476	97,949	72,653	104,945	71,366
KANSAS TOTAL								813	3,070	982	1,012	1,912
OTHER WS CENTRAL FLYWAY TOTAL - not including Kansas								109,663	94,879	71,672	103,933	69,455
TOTAL FOR INCREASED PERCENTAGES (10% in KS, NE, OK, TX, 30% in CO, 80% in NM)								112,324	108,305	85,447	114,250	82,468
Great-tailed Grackle												
KS DRC (w)	1,706	3,175	454	839	0	0.007%	163	19	36	5	10	0
KS DRC (m)	680	2,722	907	907	1,814	0.026%	163	29	115	38	38	77
NE DRC (w)	46	0	0	0	0	0.003%	163	0	0	0	0	0
NM DRC (w)	0	46	0	0	0	1.072%	163	0	80	0	0	0
OK DRC (w)	60	0	46	0	18	0.036%	163	4	0	3	0	1
OK CGRK all	18	5	0	0	7	100%	163	0	815	0	0	1,141

TX feed DRC (w)	907	0	91	0	101	0.410%	163	606	0	61	0	67
TX feed DRC (m)	36	0	0	23	0	1.057%	163	62	0	0	40	0
TX DRC CGRK all	18	98	179	315	357	100%	163	2,934	15,974	29,177	51,345	58,191
TX rice DRC (w)	1,007	802	572	942	593	2.589%	385	10,037	7,994	5,701	9,390	5,911
TX rice DRC (m)	0	28	0	0	0	5.112%	385	0	551	0	0	0
TX Avitrol (w)	0	0	80	0	0	0.410%	85	0	0	28	0	0
TX Avitrol (m)	0	0	0	0	16	1.057%	85	0	0	0	0	14
KS Other (w)	0	0	220	875	0	0.007%		0	0	0	0	0
KS Other (m)	0	0	95	293	0	0.026%		0	0	0	0	0
NE Other (m)	24	14	0	0	0	0.001%		0	0	0	0	0
OK Other (w)	679	971	46	0	10	0.036%		0	0	0	0	0
OK Other (m)	2,019	2,878	2,094	859	66	0.111%		2	3	2	1	0
TX Other (m)	13	0	0	13	0	1.057%		0	0	0	0	0
Other take CO	Other take included decoy cage traps and shooting							0	0	0	1	0
Other take KS								14	8	8	0	0
Other take OK								101	241	296	80	27
Other take TX								1,686	1,881	420	730	1,913
TOTAL GREAT-TAILED GRACKLE TAKE BY WS IN THE CENTRAL FLYWAY								15,495	27,700	35,740	61,634	67,343
KANSAS TOTAL								62	160	52	48	77
OTHER WS CENTRAL FLYWAY TOTAL - not including Kansas								15,433	27,540	35,688	61,586	67,266
TOTAL FOR INCREASED PERCENTAGES (10% in KS, NE, OK, TX, 30% in CO, 80% in NM)								16,218	27,882	35,877	61,723	67,503
Brewer's Blackbird												
KS DRC (w)	1,706	3,175	454	839	0	0.006%	325	33	62	9	16	0
KS DRC (m)	680	2,722	907	907	1,814	0.003%	325	7	27	9	9	18
NE DRC (w)	46	0	0	0	0	0.011%	325	2	0	0	0	0
NM DRC (w)	0	46	0	0	0	0.036%	325	0	5	0	0	0
OK DRC (w)	60	0	46	0	18	0.127%	325	25	0	19	0	8
TX feed DRC (w)	907	0	91	0	101	0.153%	325	451	0	45	0	50
TX feed DRC (m)	36	0	0	23	0	0.076%	325	9	0	0	6	0
TX rice DRC (w)	1,007	802	572	942	593	2.566%	770	19,897	15,846	11,302	18,612	11,717
TX rice DRC (m)	0	28	0	0	0	1.283%	770	0	277	0	0	0
TX Avitrol (w)	0	0	80	0	0	0.153%	170	0	0	21	0	0
TX Avitrol (m)	0	0	0	0	16	0.076%	170	0	0	0	0	2
KS Other (w)	0	0	220	875	0	0.006%		0	0	0	0	0
KS Other (m)	0	0	95	293	0	0.003%		0	0	0	0	0
NE Other (m)	24	14	0	0	0	0.006%		0	0	0	0	0
OK Other (w)	679	971	46	0	10	0.127%		1	1	0	0	0
OK Other (m)	2,019	2,878	2,094	859	66	0.063%		1	2	1	1	0
TX Other (m)	13	0	0	13	0	0.076%		0	0	0	0	0
TOTAL BREWER'S BLACKBIRD TAKE BY WS IN THE CENTRAL FLYWAY								20,425	16,220	11,406	18,644	11,794
KANSAS TOTAL								41	90	19	26	18
OTHER WS CENTRAL FLYWAY TOTAL - not including Kansas								20,384	16,129	11,387	18,618	11,777
TOTAL FOR INCREASED PERCENTAGES (10% in KS, NE, OK, TX, 30% in CO, 80% in NM)								20,953	16,313	11,510	18,675	11,872
Yellow-headed Blackbird												
KS DRC (w)	1,706	3,175	454	839	0	0.001%	163	3	5	1	1	0
KS DRC (m)	680	2,722	907	907	1,814	0.030%	163	33	133	44	44	89
NE DRC (w)	46	0	0	0	0	0.003%	163	0	0	0	0	0
NM DRC (w)	0	46	0	0	0	0.000%	163	0	0	0	0	0
OK DRC (w)	60	0	46	0	18	0.001%	163	0	0	0	0	0

TX feed DRC (w)	907	0	91	0	101	0.008%	163	12	0	1	0	1
TX feed DRC (m)	36	0	0	23	0	0.030%	163	2	0	0	1	0
TX rice DRC (w)	1,007	802	572	942	593	0.000%	385	0	0	0	0	0
TX rice DRC (m)	0	28	0	0	0	0.000%	385	0	0	0	0	0
TX Avitrol (w)	0	0	80	0	0	0.008%	85	0	0	1	0	0
TX Avitrol (m)	0	0	0	0	16	0.030%	85	0	0	0	0	0
KS Other (w)	0	0	220	875	0	0.001%		0	0	0	0	0
KS Other (m)	0	0	95	293	0	0.030%		0	0	0	0	0
NE Other (m)	24	14	0	0	0	0.090%		0	0	0	0	0
OK Other (w)	679	971	46	0	10	0.001%		0	0	0	0	0
OK Other (m)	2,019	2,878	2,094	859	66	0.030%		1	1	1	0	0
TX Other (m)	13	0	0	13	0	0.030%		0	0	0	0	0
TOTAL YELLOW-HEADED BLACKBIRD TAKE BY WS IN THE CENTRAL FLYWAY								51	139	48	47	90
KANSAS TOTAL								36	138	45	46	89
OTHER WS CENTRAL FLYWAY TOTAL - not including Kansas								15	1	2	1	2
YELLOW-HEADED BLACKBIRD TAKE WITHOUT ADDED ESTIMATE								14	0	2	1	2
TOTAL FOR INCREASED PERCENTAGES (10% in KS, NE, OK, TX, 30% in CO, 80% in NM)								101	278	95	94	181
Rusty Blackbird												
KS DRC (w)	1,706	3,175	454	839	0	0.001%	325	6	10	1	3	0
KS DRC (m)	680	2,722	907	907	1,814	0.000%	325	0	0	0	0	0
NE DRC (w)	46	0	0	0	0	0.012%	325	2	0	0	0	0
NM DRC (w)	0	46	0	0	0	0.009%	325	0	1	0	0	0
OK DRC (w)	60	0	46	0	18	0.016%	325	3	0	2	0	1
TX feed DRC (w)	907	0	91	0	101	0.001%	325	3	0	0	0	0
TX feed DRC (m)	36	0	0	23	0	0.000%	325	0	0	0	0	0
TX rice DRC (w)	1,007	802	572	942	593	0.004%	770	31	25	18	29	18
TX rice DRC (m)	0	28	0	0	0	0.002%	770	0	0	0	0	0
TX Avitrol (w)	0	0	80	0	0	0.001%	170	0	0	0	0	0
TX Avitrol (m)	0	0	0	0	16	0.000%	170	0	0	0	0	0
KS Other (w)	0	0	220	875	0	0.001%		0	0	0	0	0
KS Other (m)	0	0	95	293	0	0.000%		0	0	0	0	0
NE Other (m)	24	14	0	0	0	0.006%		0	0	0	0	0
OK Other (w)	679	971	46	0	10	0.016%		0	0	0	0	0
OK Other (m)	2,019	2,878	2,094	859	66	0.008%		0	0	0	0	0
TX Other (m)	13	0	0	13	0	0.000%		0	0	0	0	0
TOTAL RUSTY BLACKBIRD TAKE BY WS IN THE CENTRAL FLYWAY								45	37	22	32	20
KANSAS TOTAL								6	10	1	3	0
OTHER WS CENTRAL FLYWAY TOTAL - not including Kansas								39	27	21	29	20
TOTAL FOR INCREASED PERCENTAGES (10% in KS, NE, OK, TX, 30% in CO, 80% in NM)								61	47	27	35	21

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APPENDIX C - Bird Species of Kansas

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

Species	*Scientific Name*
Anseriformes - Waterfowl	
Tundra Swan[2]	*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*
Lesser Prairie-Chicken*	*Tympanuchus pallidicinctus*
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*
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	
Common Moorhen	*Gallinula chloropus*
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*

Species	*Scientific Name*
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*
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*
Family Cuculidae – Cuckoos and Roadrunners	
Greater Roadrunner[5]	*Geococcyx californianus*
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	

Species	*Scientific Name*
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*
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 ** = Kansas only Listed T&E spp.
SMC = Species of Management Concern (USFWS 1995)
SNC = Species in Need of Conservation (KDWP 2005)

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

Species	*Scientific Name*
Scaled Quail	*Callipepla squamata*
Yellow Rail [SMC]	*Coturnicops noveboracensis*
Black Rail [SMC]	*Laterallus jamaicensis*
King Rail	*Rallus elegans*
Virginia Rail	*Rallus limicola*
Sora	*Porzana carolina*
Black-billed Cuckoo	*Coccyzus erythropthalmus*
Yellow-billed Cuckoo	*Coccyzus americanus*
Eastern Screech-Owl	*Otus asio*
Northern Saw-whet Owl	*Aegolius acadicus*
Chuck-will's-widow	*Caprimulgus carolinensis*
Whip-poor-will [SNC]	*Caprimulgus vociferus*
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*
White-eyed Vireo	*Vireo griseus*
Bell's Vireo	*Vireo bellii*
Black-capped Vireo*	*Vireo atricapillus*
Blue-headed Vireo	*Vireo solitarius*
Yellow-throated Vireo	*Vireo flavifrons*
Warbling Vireo	*Vireo gilvus*
Philadelphia Vireo	*Vireo philadelphicus*
Red-eyed Vireo	*Vireo olivaceus*
Carolina Chickadee	*Parus carolinensis*
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*
Bewick's Wren [SMC]	*Thryomanes bewickii*
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*
Curve-billed Thrasher [SNC]	*Toxostoma curvirostre*
Bohemian Waxwing	*Bombycilla garrulus*
Blue-winged Warbler	*Vermivora pinus*
Golden-winged Warbler	*Vermivora chrysoptera*
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*
Black-throated Blue Warbler	*Dendroica caerulescens*
Yellow-rumped Warbler	*Dendroica coronata*
Black-throated Green Warbler	*Dendroica virens*
Blackburnian Warbler	*Dendroica fusca*
Yellow-throated Warbler [SNC]	*Dendroica dominica*
Pine Warbler	*Dendroica pinus*
Prairie Warbler	*Dendroica discolor*
Palm Warbler	*Dendroica palmarum*
Bay-breasted Warbler	*Dendroica castanea*
Blackpoll Warbler	*Dendroica striata*
Cerulean Warbler [SMC]	*Dendroica cerulea*
Black-and-white Warbler	*Mniotilta varia*
American Redstart	*Setophaga ruticilla*
Prothonotary Warbler	*Protonotaria citrea*
Worm-eating Warbler	*Helmitheros vermivorus*
Ovenbird	*Seiurus aurocapillus*
Northern Waterthrush	*Seiurus noveboracensis*
Louisiana Waterthrush	*Seiurus motacilla*
Kentucky Warbler	*Oporornis formosus*
Mourning Warbler	*Oporornis philadelphia*
Common Yellowthroat	*Geothlypis trichas*
Hooded Warbler	*Wilsonia citrina*
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*
Painted Bunting	*Passerina ciris*
Green-tailed Towhee	*Pipilo chlorurus*
Eastern Towhee	*Pipilo erythrophthalmus*
Spotted Towhee	*Pipilo maculatus*
Canyon Towhee	*Pipilo fuscus*
Cassin's Sparrow [SMC]	*Aimophila cassinii*
Rufous-crowned Sparrow	*Aimophila ruficeps*
American Tree Sparrow	*Spizella arborea*
Chipping Sparrow	*Spizella passerina*
Clay-colored Sparrow	*Spizella pallida*
Brewer's Sparrow [SMC]	*Spizella breweri*
Field Sparrow	*Spizella pusilla*
Black-chinned Sparrow	*Spizella atrogularis*
Vesper Sparrow	*Pooecetes gramineus*
Lark Sparrow	*Chondestes grammacus*
Lark Bunting [SMC]	*Calamospiza melanocorys*
Savannah Sparrow	*Passerculus sandwichensis*
Baird's Sparrow [SMC]	*Ammodramus bairdii*
Grasshopper Sparrow [SMC]	*Ammodramus savannarum*
Henslow's Sparrow [SMC]	*Ammodramus henslowii*
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 (KDWP 2005)

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

Species	*Scientific Name*
Red-throated loon	*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 ajaia*
Wood Stork	*Mycteria americana*
Greater Flamingo	*Phoenicopterus ruber*
Fulvous Whistling-Duck	*Dendrocygna bicolor*
Black-bellied Whistling-Duck	*Dendrocygna autumnalis*
Trumpeter Swan SMC	*Cygnus buccinator*
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*

Species	*Scientific Name*
Swallow-tailed Kite	*Elanoides forficatus*
White-tailed Kite	*Elanus leucurus*
Northern Goshawk SMC	*Accpiter gentilis*
Harris' Hawk	*Parabuteo unicinctus*
Gray Hawk (H)	*Buteo nitidus*
Gyrfalcon	*Falco rusticolus*
Ruffed Grouse	*Bonasa umbellus*
Sharp-tailed Grouse	*Tympanuchus phasianellus*
Purple Gallinule	*Porphyrula martinica*
Wilson's Plover (H)	*Charadrius wilsonia*
Spotted Redshank	*Tringa erythropus*
Eskimo Curlew*	*Numenius borealis*
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*
Thayer's Gull	*Larus thayeri*
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*
Gull-billed Tern	*Sterna nilotica*
Arctic Tern (H)	*Sterna paradisaea*
Black Skimmer	*Rhynchops niger*
Long-billed Murrelet (H)	*Brachyramphus pardix*
Band-tailed Pigeon	*Columba fasciata*
White-winged Dove	*Zenaida asiatica*
Inca Dove	*Scardafella inca*
Common Ground-Dove	*Columbina passerina*
Groove-billed Ani	*Crotophaga sulcirostris*
Flammulated Owl (H)	*Otus flammeolus*
Western Screech-Owl	*Otus kennicottii*
Snowy Owl	*Nyctea scandiaca*
Lesser Nighthawk	*Chordeiles acutipennis*
Common Poorwill	*Phalaenoptilus nuttallii*
White-throated Swift	*Aeronautes saxatilis*
Magnificent Hummingbird	*Eugenes fulgens*
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*
Allen's Hummingbird	*Selasphorus sasin*
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*
Black Phoebe (H)	*Sayornis nigricans*
Eastern Phoebe	*Sayornis phoebe*
Vermillion Flycatcher	*Pyrocephalus rubinus*
Ash-throated Flycatcher	*Myiarchus cinerascens*
Great Kiskadee	*Pitangus sulphuratus*
Fork-tailed Flycatcher (H)	*Tyrannus savana*
Violet-green Swallow	*Tachycineta thalassina*
Cave Swallow	*Hirundofulva*

Species	*Scientific Name*
Steller's Jay	*Cyanocitta stelleri*
Western Scrub Jay	*Aphelocoma californica*
Mexican Jay	*Aphelocoma ultramarina*
Pinyon Jay	*Gymnorhinus cyanocephalus*
Clark's Nutcracker	*Nucifraga columbiana*
Mountain Chickadee	*Parus gambeli*
Juniper Titmouse (H)	*Parus ridgwayi*
Bushtit	*Psaltriparus minimus*
Pygmy Nuthatch	*Sitta pygmaea*
Brown-headed Nuthatch	*Sitta pusilla*
Canyon Wren	*Catherpes mexicanus*
Northern Wheatear (H)	*Oenanthe oenanthe*
Western Bluebird (H)	*Sialia mexicana*
Varied Thrush	*Ixoreus naevius*
Sage Thrasher	*Oreoscoptes montanus*
Phainopepla	*Phainopepla nitens*
Gray Vireo SMC	*Vireo vicinior*
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*

Species	*Scientific Name*
Hermit Warbler	*Dendroica occidentalis*
Swainson's Warbler	*Limnothylpis swainsonii*
Connecticut Warbler	*Oporornis agilis*
MacGillivray's Warbler	*Oporornis tolmiei*
Painted Redstart	*Myioborus pictus*
Western Tanager	*Piranga ludoviciana*
Bachman's Sparrow	*Aimophila aestivalis*
Black-throated Sparrow	*Amphispiza bilineata*
Sage Sparrow	*Amphispiza belli*
Golden-crowned Sparrow	*Zonotrichia atricapilla*
Pyrrhuloxia	*Cardinalis sinuatus*
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*
Shiny Cowbird (H)	*Molothrus bonariensis*

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