ENVIRONMENTAL ASSESSMENT (EA)

FINAL

BIRD DAMAGE MANAGEMENT IN THE TENNESSEE WILDLIFE SERVICES PROGRAM

UNITED STATES DEPARTMENT OF AGRICULTURE (USDA)
ANIMAL AND PLANT HEALTH INSPECTION SERVICE (APHIS)
WILDLIFE SERVICES (WS)

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i i **LIST OF TABLES AND FIGURES** vi
ii . i **Tables**. vii
ii . ii **Figures**. vii

i.i i **ACRONYMS** vii

1.0 **CHAPTER 1: PURPOSE OF AND NEED FOR ACTION** . . . . . 1 - 1
1.1 **Introduction** . . . . . 1 - 1
1.2 **Purpose** . . . . . 1 - 1
1.3 **Need For Action** . . . . . 1 - 2
1.3.1 **Summary of Proposed Action** . . . . . 1 - 2
1.3.2 **Need For Bird Damage Management to Protect Human Health and Safety** . . . . . 1 - 2
1.3.3 **Need For Bird Damage Management at Airports** . . . . . 1 - 5
1.3.4 **Need For Bird Damage Management to Protect Agriculture** . . . . . 1 - 6

1.3.5 **Need for Bird Damage Management to Protect Property** . . . . . 1 - 10
1.3.6 **Need For Bird Damage Management to Protect Aquaculture.** . . . . . 1 - 11
1.3.7 **Need For Bird Damage Management to Protect Wildlife Including T&E Species** . . . . . 1 - 11

1.4 **RELATIONSHIP OF THIS EA TO OTHER ENVIRONMENTAL DOCUMENTS** . . . . . 1 - 11

1.5 **DECISION TO BE MADE** . . . . . 1 - 11

1.6 **SCOPE OF THIS ENVIRONMENTAL ASSESSMENT** . . . . . 1 - 12
1.6.1 Actions Analyzed . . . . . 1 - 12
1.6.2 Period for Which this EA is Valid . . . . . 1 - 12
1.6.3 American Indian Tribes and Land . . . . . 1 - 12
1.6.4 Site Specificity . . . . . 1 - 12
1.6.5 Summary of Public Involvement . . . . . 1 - 12

1.7 **AUTHORITY AND COMPLIANCE** . . . . . 1 - 13
1.7.1 Authority of Federal and State Agencies in Bird Damage Management in Tennessee . . . . . 1 - 13
1.7.1.1 WS Legislative Authorities . . . . . 1 - 13
1.7.1.2 Tennessee Wildlife Resources Agency (TWRA) . . . . . 1 - 13
1.7.1.3 U.S. Fish and Wildlife Service (USFWS) . . . . . 1 - 14
1.7.2 Compliance With Other Federal Laws . . . . . 1 - 14
1.7.2.1 National Environmental Policy Act (NEPA) . . . . . 1 - 14
1.7.2.2 Endangered Species Act (ESA) . . . . . 1 - 14
1.7.2.3 Migratory Bird Treaty Act of 1918 (16 U.S.C. 703-711; 40 Stat. 755), as Amended . . . . . 1 - 14
1.7.2.4 Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) . . . . . 1 - 15
1.7.2.5 National Historic Preservation Act (NHPA) of 1966 as amended . . . . . 1 - 15
1.7.2.6 The Clean Water Act (33 U.S.C. 1344) . . . . . 1 - 16
1.7.2.7 Executive Order 13112 On Invasive Species . . . . . 1 - 16
1.7.2.8 Memoranda Of Understanding (MOU) Between Various Agencies And WS In Tennessee . . . . . 1 - 16

2.0 **CHAPTER 2 - ISSUES** . . . . . 2 - 1

2.1 **SUMMARY OF ISSUES** . . . . . 2 - 1

2.2 ISSUES ADDRESSED IN THE ANALYSIS OF ALTERNATIVES . . . . . 2 - 1
2.2.1. Effects on Wildlife . . . . . 2 - 1
2.2.1.1 Effects on Target Bird Species Populations . . . . . 2 - 1
2.2.1.2 Effects on Nontarget Species populations, including T&E Species . . . . . 2 - 1
2.2.2 Effects on Human Health and Safety . . . . . 2 - 2
2.2.2.1 Safety and Efficacy of Chemical Control Methods. . . . . 2 - 2
2.2.2.2 Effects on Human Health And Safety From Non-chemical BDM Methods . . . . . 2 - 2
2.2.2.3 Effects on Human Health And Safety From Not Conducting BDM to Reduce Human / Aggressive Bird Confrontations, Disease Threats or Outbreaks And Bird Strike Hazards at Airports . . . . . 2 - 2
2.2.3 Effects On Socio-cultural And Economics of The Human Environment . . . . . 2 - 3
2.2.3.1 Effects on Human Affectionate-Bonds With Individual Birds And on Aesthetic Values of Wild Bird Species . . . . . 2 - 3
2.2.3.2 Effects on Aesthetics and Value of Property Damaged by Birds . . . . . 2 - 4
2.2.4 Humaneness and Animal Welfare Concerns of Methods Used by WS . . . . . 2 - 4

2.3 ISSUES CONSIDERED BUT NOT IN DETAIL WITH RATIONALE . . . . . 2 - 5
2.3.1. Appropriateness of Preparing an EA (Instead of an EIS) For Such a Large Area 2 - 5

2.3.3 Effects on Public Use of Migratory Birds . . . . . 2 - 6
2.3.4 WS's Effect on Biodiversity . . . . . 2 - 6
2.3.5 Wildlife Damage is a Cost of Doing Business -- a "Threshold of Loss" Should Be Established Before Allowing Any Lethal Bird Damage Management. . . . . . 2 - 7
2.3.6 Wildlife Damage Management Should Not Occur at Taxpayer Expense, But Should Be Fee Based . . . . . 2 - 7
2.3.7 Cultural Resource Concerns . . . . . 2 - 7
2.3.8 Environmental Justice And Executive Order 12898 . . . . . 2 - 8
2.3.9 Lethal BDM for blackbirds and European starlings is futile because 50-60% of them die each year anyway . . . . . 2 - 8
2.3.10 Cost Effectiveness of BDM . . . . . 2 - 9
2.3.11 Protection of Children from Environmental Health and Safety Risks (Executive Order 13045) . . . . . 2 - 9

3.0 CHAPTER 3: OBJECTIVES . . . . . 3 - 1

3.1 SUMMARY OF OBJECTIVES . . . . . 3 - 1

3.2 DESCRIPTION OF OBJECTIVES . . . . . 3 - 1
3.2.1 Reductions In Damage To Agriculture . . . . . 3 - 1
3.2.2 Reductions In Bird-caused Human Health And Safety Incidents . . . . . 3 - 2
3.2.3 Reductions In Damage To Property Caused By Birds . . . . . 3 - 2
3.2.4. Reductions In Damage To Natural Resources Caused By Birds . . . . . 3 - 3

3.3 METHODS FOR MEASURING ACCOMPLISHMENTS OF OBJECTIVES IN DIRECT ASSISTANCE PROGRAMS . . . . . 3 - 3
3.3.1 Qualitative Methods . . . . . 3 - 4
3.3.1.1 Cooperator Assessment Of Work Plan Accomplishments As A Measure Of Achieving Objectives . . . . . 3 - 4
3.3.2 Quantitative Methods . . . . . 3 - 6

3.3.2.1 Observed / Calculated Damage Reductions As A Measure Of Achieving Objectives . . . 3 - 6
3.3.2.2 Observed / Calculated Resources Saved As A Measure Of Achieving Objectives . . . 3 - 6

3.4 DETERMINATION OF OVERALL OBJECTIVE GRADE . . . 3 - 8

4.0 CHAPTER 4: ALTERNATIVES INCLUDING THE PROPOSED ACTION . . . 4 - 1

4.1 DESCRIPTION OF THE ALTERNATIVES . . . 4 - 1
4.1.1 Alternative 1 - Continue the Current Federal BDM Program (No Action / Proposed Action) . . . 4 - 1
4.1.2 Alternative 2 - Nonlethal BDM Only By WS . . . 4 - 2
4.1.3 Alternative 3 - Technical Assistance Only . . . 4 - 2
4.1.4 Alternative 4 - No Federal WS BDM . . . 4 - 2

4.2 BDM STRATEGIES AND METHODOLOGIES AVAILABLE TO WS IN TENNESSEE . . . 4 - 2
4.2.1 Integrated Wildlife Damage Management (IWDM) . . . 4 - 2
4.2.2 The IWDM Strategies That WS Employs . . . 4 - 3
4.2.2.1 Technical Assistance Recommendations . . . 4 - 3
4.2.2.2 Direct Damage Management Assistance . . . 4 - 3
4.2.2.3 Examples of WS Direct Operational and Technical Assistance in BDM in Tennessee. . . . 4 - 3
4.2.3 WS Decision Making . . . 4 - 6
4.2.4 Bird Damage Management Methods Available for Use. . . . 4 - 7
4.2.4.1 Nonchemical, Nonlethal Methods . . . 4 - 7
4.2.4.2 Chemical, Nonlethal Methods . . . 4 - 8
4.2.4.3 Mechanical, Lethal Methods (See Appendix B for detailed descriptions) 4 - 8
4.2.4.4 Chemical, Lethal Methods (See Appendix B for detailed descriptions) . 4 - 8
4.2.4.5 Mechanical, Lethal Methods . . . 4 - 9
4.2.5 ALTERNATIVE 2 - Nonlethal BDM Only By WS . . . 4 - 9
4.2.6 ALTERNATIVE 3 - Technical Assistance Only . . . 4 - 9
4.2.7 ALTERNATIVE 4 - No Federal WS Bird Damage Management . . . 4 - 10

4.3 ALTERNATIVES CONSIDERED BUT NOT ANALYZED IN DETAIL WITH RATIONALE . . . 4 - 10
4.3.1 Lethal BDM Only By WS . . . 4 - 10
4.3.2 Compensation for Bird Damage Losses . . . 4 - 10
4.3.3 Short Term Eradication and Long Term Population Suppression . . . 4 - 11

4.4 MITIGATION AND STANDARD OPERATING PROCEDURES FOR BIRD DAMAGE MANAGEMENT TECHNIQUES . . . 4 - 13
4.4.1 Mitigation in Standard Operating Procedures (SOPs) . . . 4 - 13
4.4.2 Additional Mitigation Specific to the Issues . . . 4 - 14
4.4.2.1 Effects on Target Species Populations . . . 4 - 14
4.4.2.2 Effects on Nontarget Species Populations Including T&E Species . . . 4 - 14

5.0 CHAPTER 5: ENVIRONMENTAL CONSEQUENCES . . . . . 5 - 1

5.1 ENVIRONMENTAL CONSEQUENCES FOR ISSUES ANALYZED IN DETAIL . . . . 5 - 1
5.1.1 Effects on Target Species Bird Populations . . . . . 5 - 1
5.1.1.1 Alternative 1. - Continue the Current Federal Bird Damage Management Program (The Proposed Action as Described in Chapter 1) . . . . . 5 - 1
5.1.1.2 Alternative 2 - Nonlethal BDM Only by WS . . . . . 5 - 16
5.1.1.3 Alternative 3 - Technical Assistance Only . . . . . 5 - 17
5.1.1.4 Alternative 4 - No Federal WS BDM . . . . . 5 - 17
5.1.2 Effects on Nontarget Species Populations, including Threatened and Endangered Species . . . . . 5 - 18
5.1.2.1 Alternative 1 - Continue the Current Federal Bird Damage Management Program (The Proposed Action) . . . . . 5 - 18
5.1.2.2 Alternative 2 - Nonlethal BDM Only by WS . . . . . 5 - 21
5.1.2.3 Alternative 3 - Technical Assistance Only . . . . . 5 - 21
5.1.2.4 Alternative 4 - No Federal WS Bird Damage Management . . . . . 5 - 21
5.1.3 Effects On Human Health and Safety . . . . . 5 - 22
5.1.3.1 Effects Of Chemical BDM Methods On Human Health By Alternative 5 - 22
Alternative 1 - Continue The Current Program (Proposed Action) . . . 5 - 22
Alternative 2 - Nonlethal BDM Only by WS . . . . . 5 - 24
Alternative 3 - Technical Assistance Only . . . . . 5 - 24
Alternative 4 - No Federal WS Bird Damage Management . . . . . 5 - 25
5.1.3.2 Effects On Human Safety Of Nonchemical BDM Methods By Alternative . . . . . 5 - 25
Alternative 1 - Continue The Current Program (Proposed Action) . . . 5 - 25
Alternative 2 - No Federal WS Bird Damage Management . . . . . 5 - 26
Alternative 3 - Technical Assistance Only . . . . . 5 - 26
Alternative 4 - Nonlethal Required Before Lethal . . . . . 5 - 26
5.1.3.3 Effects On Human Health By Injurious Birds For Which BDM Is Requested By Alternative . . . . . 5 - 27
Alternative 1 - Continue The Current Program (Proposed Action) . . . 5 - 27
Alternative 2 - Nonlethal BDM Only by WS . . . . . 5 - 27
Alternative 3 - Technical Assistance Only . . . . . 5 - 28
Alternative 4 - No Federal WS Bird Damage Management . . . . . 5 - 28
5.1.4 Effects On Aesthetics . . . . . 5 - 28
5.1.4.1 Effects On Human Affectionate-Bonds With Individual Birds And On Aesthetic Values Of Wild Bird Species . . . . . 5 - 28
Alternative 1 - Continue The Current Program (Proposed Action) . . . 5 - 28
Alternative 2 - Nonlethal BDM Only By WS . . . . . 5 - 29
Alternative 3 - Technical Assistance Only . . . . . 5 - 29
Alternative 4 - No Federal WS Bird Damage Management . . . . . 5 - 29
5.1.4.2 Effects On Aesthetic Values Of Property Damaged By Birds . . . . . 5 - 30
Alternative 1 - Continue The Current Program (Proposed Action) . . . 5 - 30
Alternative 2 - Nonlethal BDM Only By WS . . . . . 5 - 30
Alternative 3 - Technical Assistance Only . . . . . 5 - 31
Alternative 4 - No Federal WS Bird Damage Management . . . . . 5 - 31
5.1.5 Humaneness of Lethal Bird Control Methods . . . . . 5 - 31
5.1.5.1 Alternative 1 - Continue the Current Program (Proposed Action) . . . . 5 - 31
5.1.5.2 Alternative 2 - Nonlethal BDM Only By WS . . . . . 5 - 32

5.1.5.3 Alternative 3 - Technical Assistance Only . . . . . 5 - 33
5.1.5.4 Alternative 4 — No Federal WS Bird Damage Management . . . . . 5 - 33

5.2 CUMULATIVE IMPACTS OF BDM METHODS BY ALTERNATIVE. . . . . 5 -34
5.2.1 Alternative 1 - Continue The Current Program (Proposed Action) . . . . . 5 -34
5.2.1.1 Cumulative Impact Potential From Chemical Components Of Alternative 1 . . . . . 5 -34
5.2.1.2 Cumulative Impact Potential From Non-Chemical Components Of Alternative 1 . . . . . 5 -36
5.2.2 Alternative 2 - Nonlethal BDM Only by WS . . . . . 5 -37
5.2.3. Alternative 3 - Technical Assistance Only . . . . . 5 -38
5.2.4 Alternative 4 - No Federal WS Bird Damage Management . . . . . 5 -38

6.0 CHAPTER 6 - PREPARERS/REVIEWERS, PERSONS CONSULTED, AND PUBLIC INVOLVEMENT . . . . . 6 - 1

6.1 LIST OF PREPARERS / REVIEWERS. 6- 1

6.2 LIST OF PERSONS CONSULTED. 6- 1

APPENDIX A

LITERATURE CITED . . . . . A - 1

APPENDIX B

BIRD DAMAGE MANAGEMENT (BDM) METHODS AVAILABLE FOR USE OR RECOMMENDATION BY THE TENNESSEE WILDLIFE SERVICES PROGRAM . . . . . B - 1

APPENDIX C

PERMITS FOR WS BDM PROGRAMS IN TENNESSEE . . . . . C - 1

APPENDIX D

MEMORANDA OF UNDERSTANDING AMONG ENTITIES COOPERATING WITH WILDLIFE SERVICES IN THE BDM PROGRAM IN TENNESSEE . . . . . D - 1

APPENDIX E

MATERIAL SAFETY DATA SHEETS AND PESTICIDE LABELS FOR PESTICIDES USED IN THE TENNESSEE WILDLIFE SERVICES BDM PROGRAM . . . . . E - 1

i LIST OF TABLES AND FIGURES Page #

ii . i Tables

Table 1-1. Information On Some Diseases Transmissable To Humans And Livestock That Are Associated With Feral Domestic Pigeons, European Starlings, And English

Sparrows. Information Taken From Weber (1979). . . . . . 1 - 3,4,5

Table 3-1. **Summary Of Prototypical Cooperative BDM Programs With Derived Grades And Calculated Score From Pooled Results For The Purpose Of Determining Success In Meeting Overall BDM Program Objectives.** . . . . . 3 - 9

Table 5-1. **Birds Killed By WS Through All Methods, And Eggs Destroyed, In Tennessee For Bird Damage Management In FY 97, 98, 99.** . . . . . 5 - 2,3,4

Table 5-2. **Relative Comparison of Anticipated Effects From Alternatives In This EA.** . . . . . 5 - 39

Table B-1. **DRC-1339 Used by Tennessee WS During Three Concurrent Fiscal Years.** . . . . . B - 10

ii . ii **Figures**

Figure 4-1. **APHIS, WS Decision Model** . . . . . 4 - 7

Figure 4-2. **Numbers of Blackbirds and European Starlings Killed vs. the Number Moved or Dispersed Via Nonlethal Means by WS FY 1997-99** . . . . . 4 - 9

i i i ACRONYMS

ADC	Animal Damage Control
APHIS	Animal and Plant Health Inspection Service
ARD	Assistant Regional Director
AVMA	American Veterinary Medical Association
BDM	Bird Damage Management
BBS	Breeding Bird Survey
CDFG	California Department Of Fish And Game
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
EA	Environmental Assessment
EEE	Eastern Equine Encephalomyelitis
EIS	Environmental Impact Statement
EJ	Environmental Justice
EPA	U.S. Environmental Protection Agency
ERO	Eastern Regional Office
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FDA	Food and Drug Administration
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FY	Fiscal Year
GPRA	Government Performance Results Act of 1993
IWDM	Integrated Wildlife Damage Management
MIS	Management Information System
MOU	Memorandum of Understanding
NEPA	National Environmental Policy Act
NWRC	National Wildlife Research Center
OSHA	Occupational Safety and Health Administration
SLE	St. Louis Encephalomyelitis
SOP	Standard Operating Procedure
TCA	Tennessee Code Anotated
TDA	Tennessee Department of Agriculture
T&E	Threatened and Endangered
TGE	Transmissible Gastroenteritis
TWRA	Tennessee Wildlife Resources Agency
USC	United States Code
USDA	U.S. Department of Agriculture
USDC	U.S. Department of Commerce
USDI	U.S. Department of Interior
USGS	U. S. Geological Survey
USFWS	U.S. Fish and Wildlife Services
WEE	Western Equine Encephalomyelitis
WS	Wildlife Services

NOTE: On August 1, 1997, the Animal Damage Control program was officially renamed to Wildlife Services. The terms Animal Damage Control, ADC, Wildlife Services, and WS are used synonymously throughout this Environmental Assessment.

1.1 Introduction

USDA/APHIS/ Wildlife Services (WS) is authorized by Congress to manage a program to reduce human/wildlife conflicts. WS's mission is to "provide leadership in wildlife damage control to protect America's agricultural, industrial and natural resources, and to safeguard public health and safety (USDA 1989)." This is accomplished through:

- training of wildlife damage management professionals;
- development and improvement of strategies to reduce economic losses and threats to humans from wildlife;
- collection, evaluation, and dissemination of management information;
- cooperative wildlife damage management programs;
- informing and educating the public on how to reduce wildlife damage and;
- providing data and a source for limited-use management materials and equipment, including pesticides (USDA 1989).

This Environmental Assessment (EA) evaluates ways by which this responsibility can be carried out to resolve conflicts with bird species in Tennessee.

WS is a cooperatively funded service-oriented program. Before any operational wildlife damage management is conducted, *Agreements for Control* or *WS Work Plans* must be completed by WS and the land owner/administrator. WS cooperates with other Federal, State and Local government entities, 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.

Individual actions on the types of sites encompassed by this analysis may be categorically excluded under the APHIS Implementing Regulations for compliance with the National Environmental Policy Act (NEPA) (7 CFR 372.5(c)). APHIS Implementing Regulations also provide that all technical assistance furnished by WS is categorically excluded (7 CFR 372.5(c)) (60 Federal Register 6,000, 6,003 (1995)). Bird damage management is a large component of the Tennessee WS program. Therefore, WS has decided to prepare this EA to assist in planning bird damage management (BDM) activities and to clearly communicate with the public the analysis of cumulative effects for a number of issues of concern in relation to alternative means of meeting needs for such management in the State. This analysis covers WS's plans for current and future BDM actions wherever they might be requested within the State of Tennessee.

1.2 Purpose

The purpose of this EA is to analyze the effects of WS activities in Tennessee to manage damage caused by bird species or species groups that include, but are not limited to, the following: European starlings (*Sturnus vulgaris*), blackbirds (family Emberizidae, subfamily Icterinae), rock doves or feral domestic pigeons (*Columba livia*), American crows (*Corvus brachyrhynchos*), woodpeckers (family Picidae), Canada geese (Branta *canadensis)*, ducks (family Anatidae, subfamily Anatinae), coots (*Fulica americana*), swallows (family Hirundinidae), house or English sparrows (*Passer domesticus*), house finch (*Carpodacus mexicanus*), raptors (hawks, owls, and vultures; families Falconidae, Accipitridae, Tytonidae, Strigidae, and Cathartidae), mourning doves (*Zenaida macroura*), gulls (family Laridae), herons and egrets (family Ardeidae), and double-crested cormorants (*Phalacrocorax auritus)*. Resources protected by such activities include agricultural crops, turf, livestock feed, livestock, livestock health, property, threatened and endangered species, other wildlife,

aquaculture, and human health and safety. Hereinafter, blackbirds refers to the blackbird group as described in the FEIS prepared by the WS program (USDA 1997). These include red-winged (*Agelaius phoeniceus*), tricolored (*A. tricolor*), rusty (*Euphagus carolinus*), Brewer's (*E. cyanocephalus*), and yellow-headed blackbirds (*Xanthocephalus xanthocephalus*), brown-headed cowbirds (*Molothrus ater*), bronzed cowbirds (*Tangavius aeneus*), great-tailed grackles (*Cassidix mexicanus*), and common grackles (*Quiscalus quiscula*).

1.3 Need For Action

1.3.1 Summary of Proposed Action

The proposed action is to continue the current portion of the WS program in Tennessee that responds to requests for BDM to protect human health and safety, agricultural crops, turf, livestock feed, livestock, livestock health, property, threatened and endangered species, and other wildlife, and aquaculture in the State of Tennessee. A major component of BDM in the Tennessee WS program is the goal of minimizing human health and safety threats and property damage in urban environments. Primary species of concern related to damage in urban environments are feral domestic pigeons, European starlings / blackbirds, English sparrows, vultures, woodpeckers, and waterfowl. The program would also operate to reduce loss or the risk of loss of agricultural crops and to reduce or minimize the loss of livestock feed and the risk of bird-related livestock health problems presented by European starling / blackbirds, and Canada geese, at requesting dairies, feedlots, and poultry operations, and to meet requests to minimize damage or the risk of damage to other agriculture, other wildlife species, property, human health and safety, or other resources caused by birds. To meet these goals WS 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 control assistance in which professional WS personnel conduct damage management actions. An Integrated Wildlife Damage Management (IWDM) approach would be implemented which would allow use of any legal technique or method, used singly or in combination, to meet requester needs for resolving conflicts with birds. Agricultural producers and others who request assistance would be provided with information regarding the use of effective nonlethal and lethal techniques. Lethal methods used by WS could include shooting, trapping, egg addling/destruction, nest destruction, DRC-1339, also called Starlicide (3-chloro-p-toluidine hydrochloride), Avitrol (4-aminopyridine), or euthanasia following live capture by trapping or use of the tranquilizer alpha-chloralose (A-C). Nonlethal methods used by WS could include porcupine wire deterrents, wire barriers and deterrents, netting, live capture and translocation using the tranquilizer A-C and/or traps, chemical repellents (e.g., methyl anthranilate, di-methyl anthranilate, or anthraquinone), and harassment with pyrotechnics, lasers, lights, vehicles, audio and visual distress. BDM by WS would be conducted 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. In addition, all individual actions would be analyzed to make sure that they are covered by this document.

1.3.2 Need For Bird Damage Management to Protect Human Health and Safety

Feral domestic pigeons and European starlings have been suspected in the transmission of 29 different diseases to humans, (Davis et.al. 1971, and Weber 1979). These include viral diseases such as meningitis and 7 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. As many as 65 different diseases transmittable to humans or domestic animals have been associated with pigeons, European starlings, and English sparrows (Weber 1979). Table 1-1 shows the more typical diseases affecting humans that can be transmitted by pigeons and European starlings. 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. Thus, it is the risk of disease transmission that is the primary reason for requesting and conducting BDM. Situations in Tennessee where the threat of disease associated with European starling, feral domestic pigeon, or English sparrow populations might occur could be:

- exposure by residents to a European starling roost which has been in a residential area for more than three years

- disturbance of a large deposit of droppings in an attic where a flock of feral domestic pigeons routinely roosts or nests

- accumulated droppings from roosting European starlings, feral domestic pigeons, or English sparrows on structures at an industrial site where employees must work in areas of accumulation

- English sparrows or European starlings nesting or loafing around a food court area of a recreational facility or other site where humans eat in close proximity to concentrated numbers of these birds

In Tennessee, American crows and European starlings form large communal roosts of the kind associated with disease organisms which grow in soils enriched by bird excrement, such as *Histoplasma capsulatum* (Weeks and Stickley 1984). Sometimes, such roosts occur in urban environments. Public health officials and residents at such sites express concerns for human health related to the potential for disease transmission where dropping deposits accumulate. WS routinely receives requests for assistance in resolving problems related to large urban crow and starling roosts in Tennessee.

Many times, individuals or property owners that request assistance with feral domestic pigeon, American crow, or nuisance blackbird or European 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 mess associated with droppings left by concentrations of birds is aesthetically displeasing and can result in continual clean-up costs. Under the proposed action, WS could agree to assist in resolving these types of problems.

WS could provide operational BDM involving virtually any bird species that poses a threat to human health and safety to any requester experiencing such damage anywhere in Tennessee.

Table 1-1. Information On Some Diseases Transmissable To Humans And Livestock That Are Associated With Feral Domestic Pigeons, European Starlings, And English Sparrows. Information Taken From Weber (1979).

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 to young children, old or infirm people	serious hazard for the swine industry
salmonellosis	gastroenteritis, septicaemia, 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 (7 forms)	headache, fever, stiff neck, vomiting, nausea, drowsiness, disorientation	mortality rate for eastern equine encephalomyelitis may be around 60%	may cause mental retardation, convulsions and paralysis
Mycotic (fungal):			
aspergillosis	affects lungs and broken skin, toxins poison blood, nerves, and body cells	not usually	causes abortions in cattle
blastomycosis	weight loss, fever, cough, bloody sputum and chest pains.	rarely	affects horses, dogs and cats
candidiasis	infection of skin, fingernails, mouth, respiratory system, intestines, and urogenital tract	rarely	causes mastitis, diarrhea, vaginal discharge and aborted fetuses in cattle
cryptococcosis	lung infection, cough, chest pain, weight loss, fever or dizziness, also causes meningitis	possible especially with meningitis	chronic mastitis in cattle, decreased milk flow and appetite loss

histoplasmosis	pulmonary or respiratory disease. May affect vision	possible, especially in infants and young children or if disease disseminates to the blood and bone marrow	actively grows and multiplies in soil and remains active long after birds have departed
Protozoal:			
American trypanosomiasis	infection of mucous membranes of eyes or nose, swelling	possible death in 2-4 weeks	caused by the conenose bug found on pigeons
toxoplasmosis	inflammation of the retina, headaches, fever, drowsiness, pneumonia, strabismus, blindness, hydrocephalus, epilepsy, and deafness	possible	may cause abortion or still birth in humans, mental retardation
Rickettsial /Chlamydial:			
chlamydiosis	pneumonia, flu-like respiratory infection, high fever, chills, loss of appetite, cough, severe headaches, generalized aches and pains, vomiting, diarrhea, hepatitis, insomnia, restlessness, low pulse rate	occasionally, restricted to old, weak or those with concurrent diseases	in cattle, may result in abortion, arthritis, conjunctivitis, and enteritis
Q fever	sudden pneumonitis, chills, fever, weakness, severe sweating, chest pain, severe headaches and sore eyes	possible	may cause abortions in sheep and goats

1.3.3 Need For Bird Damage Management at Airports

It is widely recognized throughout the civil and military aviation communities that the threat to human health and safety from aircraft collisions with wildlife is increasing (Dolbeer 2000). Collisions between aircraft and wildlife are a concern throughout the world because they threaten passenger safety (Thorpe 1997), result in lost revenue and costly repairs to aircraft (Milsom and Horton 1990, Linnell 1996, Robinson 1997), and can erode public confidence in the air transport industry as a whole (Conover et al. 1995). Other than controlled flight into terrain, wildlife strikes have caused more aviation fatalities than any other single source (Eschenfelder 2000). In several instances, wildlife-aircraft collisions in the United States have resulted in human fatalities, the most recent of which occurred in 1995 when an Air Force E-3B AWACS aircraft collided with a flock of Canada geese on Elmondorf Air Force Base, Alaska, killing all 24 passengers and crew (Gresh 1996, Ohashi et al. 1996). In addition a $190 million plane was lost (Dolbeer 1997). The risk that birds pose to aircraft is well documented with the case reported in Boston in 1960 when 62 people were killed in the crash of an airliner which collided with a flock of European starlings (Terres 1980). Again, in 1999, a Boeing 757 struck a flock of European starlings at the [redacted] Airport and was forced to abort the flight (NTSB 1999). Damages were assessed at more than $500,000 by airport officials ([redacted], WS Pers. Comm. 1999). These are of course, extreme examples, but the safety hazards are very real and the proportion of wildlife strikes that result in damage is often substantial enough to merit closer scrutiny by the Federal Aviation Administration (FAA). Between 1990 and 1999, 28,150 wildlife strikes were reported to the Federal Aviation

Administration (FAA0. There was a 33% increase in the number of wildlife strikes reported in 1999 over 1998, and a 181% increase in the number of strikes reported between 1990 and 1999 (Cleary 2000). As a result of several factors, experts within the FFA, USDA, and US Air Force expect the risk, frequency, and potential severity of wildlife-aircraft collisions to escalate over the next decade (Cleary 2000).

WS receives several requests annually for assistance regarding bird damage management at airports in Tennessee. During FY 1999 - 2001 WS provided operational and/or technical assistance to the majority of certificated, general aviation, and military airports in Tennessee to resolve existing or potential bird hazards. These requests are considered serious because of the potential for loss of human life and because damage to aircraft can be extremely expensive. WS could provide operational BDM involving virtually any bird species that poses a strike hazard at the request of any aviation facility in the State.

1.3.4 Need For Bird Damage Management to Protect Agriculture

Damage to agricultural crops by all bird species reported to WS by the public during FY 1999-2001 averaged $30,943 per year in Tennessee (USDA-WS MIS Database). Several species including black vultures, European starlings, and Canada geese are responsible for the majority of agricultural related damages. Canada goose populations are at a record high in Tennessee with estimated resident populations of more than 66,000 in 2001 (E. Warr, TWRA Pers. Comm. 2001). Geese rely on a variety of agricultural crops such as wheat, corn, soybeans, and cereal crops. These birds feed on waste grain in harvested fields during late fall and winter and little damage results from these activities. However, in addition to feeding on grain, young shoots of agricultural crops and grasses are favored by them. As a result, winter wheat is sometimes heavily damaged by feeding birds, as is early spring crops, and pasture lands. On the other hand, some information suggests that such damage may be partially offset by the effect that droppings left by these birds has on increasing the nitrogen content of crop soils and thus enhancing yields (Bell and Klimstra 1970). In the United States, legal hunting has proven successful in mitigating damage to crops in some instances (W.K. Pfeifer, 1983).

Several studies have shown that blackbirds and European starlings can pose a great economic threat to agricultural producers (Besser et. al. 1968, Dolbeer et.al. 1978, and Feare 1984). Fruit or nut crops, especially pecans, can be severely damaged by blackbirds, American crows, and ravens. Bird damage to crops has occasionally been identified as a major problem in the State. In one instance,in May, 2000, WS was contacted by a Fentress County producer who was growing 120 acres of snap beans under a contract with a large retail grocery store. Non-migratory Canada geese had damaged 5 acres of sprouting beans. While feeding, the geese would pull the young sprout from the ground. This producer estimated losses due to the geese to be approximately $2,400 (D. Lingo, USDA, Pers. Comm. 2000).

Cattle producers often express concern with vultures, especially black vultures, being around cattle during calving season. Producers typically report black vultures “aggravating” cows that are trying to give birth, as well as attacking and feeding on cows during the birthing process. Black vultures are also known to attack and kill newborn calves. In many cases, this problem is an annual occurrence. In July, 2001 a cattle producer in Henry County contacted WS regarding black vultures killing two newborn calves. This producer reported a loss of $500.00 associated with this one incident. In a

separate incidence, a cooperator from Maury County reported the loss of 11 calves valued at $11,000 to black vultures in August 2001(USDA-WS MIS Database).

WS could provide operational BDM involving virtually any bird species that poses a threat to agriculture to any requester experiencing such damage anywhere in Tennessee.

1.3.5 Need for Bird Damage Management to Protect Property

Birds frequently 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, can occur because of uric acid from bird droppings. Electrical utility companies frequently have problems with birds causing power outages by shorting out transformers and substations. Persons and businesses concerned about these types of damage may request WS assistance. The total value of property damage by birds reported to WS in Tennessee for the three-year period of FY 1999 - 2001 was approximately 1.4 million dollars with the annual average being $466,487. This included property damage reported for residential and non-residential buildings, landscaping and turf, and structures (USDA-WS MIS Database). WS could be requested to provide BDM assistance on any of these types or similar damage situations in the State.

Tennessee supports one of the largest wintering concentrations of European starlings in the United States. These birds form large communal roosts in the winter. Often times these roosts are composed of mixed species including starlings and blackbirds. The growing urbanization of wintering starling/blackbird flocks seeking warmth and shelter for roosting causes substantial problems and damages to property and structures including utility stations, buildings, and hydroelectric dams. In Tennessee, WS responded to 438 requests for assistance during FY 1999-2001 to address $575,900 in property related damages caused by starlings/blackbirds at various locations throughout the state. Starling/blackbird related damages to structures during FY 1999-2001averaged $191,966 per year (USDA-WS MIS Database).

Feral domestic and wild waterfowl sometimes congregate at golf courses, parks, other recreational areas, and business complexes that have ponds or watercourses and cause damage by grazing on turf and by deposition of droppings. In Tennessee, WS responded to 509 requests for assistance during FY 1999-2001 to address $230,700 in damage caused by waterfowl at various facilities. Damage caused by waterfowl included $107,200 in damages at golf courses and $55,050 in damages to landscaping, turf, and other types of property (USDA-WS MIS Database). Economic damage has been in the form of cleanup of parking lots, retention ponds, sidewalks, patios, and lawns at business, residential and recreational locations. At golf courses, costs have been associated with restoration of greens and other turf areas, cleanup of human use areas, and lost revenue from loss of memberships. Members and the club's management were also concerned about possible health hazards from exposure to the droppings. WS has provided technical assistance to these facilities, and operational BDM assistance to live capture and translocate offending waterfowl.

WS could provide operational BDM involving virtually any bird species that poses a threat to property to any requester experiencing such damage anywhere in Tennessee.

1.3.6 Need For Bird Damage Management to Protect Aquaculture.

Aquaculture in Tennessee consists of both commercial fish production for the consumer market by private industry, and sport fish production in hatcheries operated by TWRA and the USFWS. The commercial aquaculture industry has recently begun to develop in Tennessee producing approximately 3.9 million dollars in total aquacultural sales in Tennessee in 1998 (UT Agricultural Extension Service 2000). A joint project of the Tennessee Aquaculture Task Force and the Agricultural Development Center was recently conducted during the summer of 2000 to assess the size, scope, inventory, situation, and market capacity of Tennessee's existing aquaculture industry. Survey results indicate that Tennessee's aquacultural producers are primarily optimistic about the future of aquaculture in Tennessee. Therefore aquaculture in Tennessee is expected to continue to grow and expand.

Sometimes fish-eating birds such as various species of herons and egrets (order *Ciconiiformes,* family *Ardeidae*), double-crested cormorants (*Phalacrocorax auritus*), herring gulls (*Larus argentatus*), ring-billed gulls (*Larus delawarensis*), ospreys (*Pandion haliaetus*), and others prey on young fry and fingerlings, adult fish ready for stocking or sale, or brood fish at these fish rearing facilities (Salmon and Conte, 1981 and Schaeffer 1992). During FY 1999 - 2001, WS responded to 18 requests for assistance with bird damage at aquacultural facilities (USDA-WS MIS Database) These complaints involved great blue herons and double-crested cormorants. Although not a widespread problem in the State, WS could be requested to assist in resolving more such problems. In most cases like these, WS only provides advice (technical assistance) to the facility operators on how to resolve such problems through primarily nonlethal means such as barrier/deterrent wires or harassment. In some cases, the facility might need to obtain a depredation permit from the USFWS to kill a few of the birds to reinforce noise harassment. WS routinely assists aquaculture producers in obtaining these permits. Under the proposed action, WS 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 harassment. WS could provide operational BDM involving virtually any bird species that poses a threat to aquaculture to any requester experiencing such damage anywhere in Tennessee.

1.3.7 Need For Bird Damage Management to Protect Wildlife Including T&E Species

Some of the species listed as threatened or endangered under the Endangered Species Act of 1973 are preyed upon or otherwise adversely affected by certain bird species. For example brood parasitism by brown-headed cowbirds has become a concern for most wildlife professionals where these birds are plentiful. With endangered bird species, such parasitism can cause enough nest failures to jeopardize the host species. Other instances where WS was requested to assist in developing programs to safeguard the survival of endangered species include protection of piping plover nests from predatory gulls in New York (J. Bucknall WS, Pers. Comm. 2001), protection of adult and young least terns and snowy plovers in California from predation by gulls, terns, ravens, and raptors (J. Turman, M. Jensen WS, Pers. Comm. 2001), protection of desert tortoises from raven predation in California and Utah, (J. Turman, WS, Pers. Comm. 2001), protection of juvenile salmonoids (steelhead and salmon) in Washington from heron, gull, tern, and cormorant predation (K. Gruver WS, Pers. Comm. 2001). In addition, other endangered species could be jeopardized by birds in Tennessee. WS could provide operational BDM involving virtually any bird species that poses a threat to wildlife, including T&E species to any requester experiencing such damage anywhere in Tennessee.

The above are just a few examples of BDM activities that WS has conducted or could conduct under the proposed action to protect other wildlife species. In most cases, if such work is requested by

another Federal agency, NEPA responsibility rests with that agency. WS could, however, agree to prepare NEPA documentation for such activities if requested by the other Federal agency.

1.4 RELATIONSHIP OF THIS ENVIRONMENTAL ASSESSMENT TO OTHER ENVIRONMENTAL DOCUMENTS

WS has issued a Final Environmental Impact Statement (FEIS) on the national APHIS/WS program (USDA 1997). This EA is tiered to the FEIS, and pertinent information available in the FEIS has been incorporated by reference into this EA.

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 the WS program be continued in the State?
- If not, how should bird damage in the State be managed and what role should WS play in this?
- Might the continuing of WS's current program of BDM have significant effects requiring preparation of an EIS?

1.6 SCOPE OF THIS ENVIRONMENTAL ASSESSMENT

1.6.1 Actions Analyzed

This EA evaluates bird damage management by WS to protect human health and safety, agricultural crops, turf, livestock, livestock health, property, threatened and endangered species, other wildlife, other natural resources, and aquaculture on private land or public facilities within the State wherever such management is requested from the WS program.

1.6.2 Period for Which this EA is Valid

This EA will remain valid until WS determines that new needs for action or new alternatives having different environmental effects must be analyzed. WS monitoring procedures direct that State or Station Directors within the agency assure that each EA for which they are responsible, the Decision associated with the EA, and the activities specified in the Decision will be reviewed annually for applicability and accuracy of the documents, monitoring compliance, and the need for further analysis and documentation due to new information or changes in activities. A report of this review is prepared and filed in the respective State or Station WS office and with the appropriate WS Regional Director. Results of the review and monitoring report will be noticed to the public, including the affected interests within five years of the Decision date for any EA's analyzing ongoing projects. This process insures that each EA is complete and still appropriate to the scope of the State BDM activities.

1.6.3 American Indian Lands and Tribes.

Currently, Tennessee WS does not have any MOUs with any American Indian tribe. If WS enters into an agreement with a tribe for BDM, this EA would be reviewed and supplemented if appropriate to

insure compliance with NEPA. MOUs, agreements and NEPA compliance would be conducted as appropriate before conducting BDM on tribal lands.

1.6.4 Site Specificity

This EA analyzes potential effects of WS's BDM activities that will occur or could occur at private property sites or at public facilities within any of the 95 Tennessee counties. Because the proposed action is to continue the current program, and because the current program's goal and responsibility are to provide service when requested within the constraints of available funding and personnel, it is conceivable that BDM activity by WS could occur anywhere in the State. Thus, this EA analyzes the potential effects of such efforts wherever and whenever they might occur as part of the current program. The EA emphasizes important issues as they relate to specific areas whenever possible. However, the issues that pertain to the various types of bird damage and resulting management are the same, for the most part, wherever they occur, and are treated as such. The standard WS Decision Model (Slate et al. 1992) and WS Directive 2.105 is the routine thought process that is the site-specific procedure for determining methods and strategies to use or recommend for individual actions conducted by WS in the State (See USDA 1997, Chapter 2 and Appendix N for a more complete description of the WS Decision Model and examples of its application). Decisions made using this thought process will be in accordance with any mitigation measures and standard operating procedures described herein and adopted or established as part of the decision.

1.6.5 Summary of Public Involvement.

Issues related to the proposed action were initially developed by WS. Issues were defined and preliminary alternatives were identified. As part of this process, and as required by the Council on Environmental Quality (CEQ) and APHIS-NEPA implementing regulations, this document and its Decision are being made available to the public through "Notices of Availability" (NOA) published in local media and through direct mailings of NOA to parties that have specifically requested to be notified. New issues or alternatives raised after publication of public notices will be fully considered to determine whether the EA and its Decision should be revisited and, if appropriate, revised.

1.7 AUTHORITY AND COMPLIANCE

1.7.1 Authority of Federal and State Agencies in Bird Damage Management in Tennessee[1]

1.7.1.1 WS Legislative Authorities

The primary statutory authority for the Wildlife Services program is the Act of 1931 (7 U.S.C. 426-426c; 46 Stat. 1468), as amended in the Fiscal Year 2001 Agriculture Appropriations Bill, which 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*

[1] See Chapter 1 of USDA (1994) for a complete discussion of Federal laws pertaining to WS.

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"."

Since 1931, with the changes in societal values, WS policies and programs place greater emphasis on the part of the Act discussing "*bringing (damage) under control*," rather than "*eradication*" and "*suppression*" of wildlife populations. In 1988, Congress strengthened the legislative mandate of WS with the Rural Development, Agriculture, and Related Agencies Appropriations Act. This Act states, 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 mammal and bird 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."

1.7.1.2 Tennessee Wildlife Resources Agency (TWRA)

The TWRA is responsible under Tennessee Code Title 70 Wildlife Resources for managing most wildlife species in the State under the direction of the Tennessee Wildlife Resources Commission. TCA 70-2-101 prohibits the taking of any wildlife without the requisite license. The statute does not, however, protect or in any way limit the taking of the crow, the starling, the feral pigeon, or the English sparrow. Pursuant to the authority granted by TCA, Section 70-4-107 and 70-5-108, Proclamation 00-10, Section IV lists the English sparrow and Starling as unprotected animals with no closed season. There are, however, both Federal and Tennessee State statutes which regulate the take of crows for sport. The Migratory Bird Treaty Act of 1918 (MBTA) directs that seasons for the sport take of crows must be limited to 124 days each year and must be held outside the prime breeding season. In Tennessee, pursuant to the authority granted by, TCA, Sections 70-4-107 and 70-5-108, the Tennessee Wildlife Resources Commission sets dates for the taking of crows, but refers to federal regulations 50 CFR Ch. 1 (21.41 and 21.43) for conditions and restrictions applicable to the taking of crows in certain depredation or health hazard situations outside of the crow sport hunting season. In addition, the TWRA participates with WS and a number of State agencies in a Memorandum of Understanding whereby participating agencies have agreed to collaborate in resolving wildlife damage issues (Appendix D).

1.7.1.3 U.S. Fish and Wildlife Service (USFWS)

The USFWS is responsible for managing and regulating take of bird species that are listed as migratory under the MBTA and those that are listed as threatened or endangered under the Endangered Species Act. Sections 1.7.2.2 and 1.7.2.3 below describe WS's interactions with the USFWS under these two laws.

1.7.2 Compliance With Other Federal Laws

Several other Federal laws authorize, regulate, or otherwise affect WS wildlife damage management. WS complies with these laws, and consults and cooperates with other agencies as appropriate.

1.7.2.1 National Environmental Policy Act (NEPA)

WS prepares analyses of the environmental effects of program activities to meet procedural requirements of this law. This EA meets the NEPA requirement for the proposed action in Tennessee. When WS operational assistance is requested by another Federal agency, NEPA compliance is the responsibility of the other Federal agency. However, WS could agree to complete NEPA documentation at the request of the other Federal agency.

1.7.2.2 Endangered Species Act (ESA)

It is Federal policy, under the ESA, that all Federal agencies will seek to conserve threatened and endangered (T&E) species, and will utilize their authorities in furtherance of the purposes of the Act (Sec.2(c)). WS conducts Section 7 consultations with the U.S. Fish & Wildlife Service (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 will use the best scientific and commercial data available*" (Sec.7(a)(2)). WS obtained a Biological Opinion (B.O.) 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 initiated formal consultation with the USFWS on several species not covered by the 1992 B.O. and the results of that consultation are pending. In addition, WS is in the process of initiating formal consultation at the programmatic level to reevaluate the 1992 B.O. and to fully evaluate potential effects on T&E species listed or proposed for listing since the 1992 FWS B.O.

1.7.2.3 Migratory Bird Treaty Act of 1918 (16 U.S.C. 703-711; 40 Stat. 755), as Amended

The Migratory Bird Treaty Act (MBTA) provides the USFWS regulatory authority to protect families of birds that contain species which migrate outside the United States. The law prohibits any "*take*" of these species by any entities, except as permitted by the USFWS; therefore, the USFWS issues permits to requesters for reducing bird damage.

WS provides 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. In severe cases of bird damage, WS provides recommendations to the USFWS for the issuance of depredation permits to private entities or other agencies. The ultimate responsibility for issuing such permits rests with the USFWS. European starlings, feral domestic pigeons, English sparrows and domestic waterfowl are not classified as protected migratory birds and therefore have no protection under this Act. USFWS depredation permits are also not required to kill yellow-headed, red-winged, rusty, and Brewer's blackbirds, cowbirds, all grackles, crows, and magpies 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 (50 CFR 21.43).

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 the WS program in Tennessee are registered with and regulated by the EPA and TDA and are used by WS in compliance with labeling procedures and requirements.

1.7.2.5 National Historic Preservation Act (NHPA) of 1966 As Amended

The National Historic Preservation Act (NHPA) of 1966, 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. WS actions on tribal lands are only conducted at the tribe's request and under signed agreement; thus, the tribes have control over any potential conflict with cultural resources on tribal properties. WS activities as described under the proposed action do not cause ground disturbances nor do they otherwise have the potential to markedly affect visual, audible, or atmospheric elements of historic properties and are thus not undertakings as defined by the NHPA. BDM could benefit historic properties if such properties were being damaged by birds. 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.

1.7.2.6 The Clean Water Act (33 U.S.C. 1344)

The Clean Water Act provides regulatory authority and guidelines for the EPA and the U.S. Army Corps Of Engineers related to wetlands. Several Sections of the Clean Water Act pertain to regulating effects to wetlands. Section 101 specifies the objectives of this Act, which are implemented largely through Subchapter III (Standards and Enforcement), Section 301 (Prohibitions). The discharge of dredged or fill material into waters of the United States is subject to permitting specified under Subchapter IV (Permits and Licenses) of this Act. Section 401 (Certification) specifies additional requirements for permit review particularly at the State level. WS consults with appropriate regulatory authorities when wetlands exist in proximity to proposed activities or when such activities might impact wetland areas. Such consultations are designed to determine if any wetlands will be affected by proposed actions.

1.7.2.7 Executive Order 13112 On Invasive Species

Executive Order 13112 - Invasive Species directs Federal agencies to use their programs and authorities to prevent the spread or to control populations of invasive species that cause economic or

environmental harm, or harm to human health. In Tennessee, WS responds to a number of requests for assistance with human health and safety threats associated with large populations of feral domestic pigeons, European starlings, and English sparrows, all invasive non-native species in the United States. To comply with Executive Order 13112, WS may cooperate with other Federal, State, or Local government agencies, or with industry or private individuals to reduce damage to the environment or threats to human health and safety.

1.7.2.8 Memoranda Of Understanding (MOU) Between Various Agencies And WS In Tennessee

A MOU (Appendix C) among the University of Tennessee Agricultural Extension Service (UTAES), Tennessee Department of Agriculture (TDA),Tennessee Department of Health and Environment (TDHE), Tennessee Wildlife Resources Agency (TWRA), Tennessee Department of Environment and Conservation (TDEC), and WS was developed in 1988. Its objectives were to 1) establish a collaborative relationship among the named participants for planning, coordinating, and implementing of animal damage control policies developed to prevent or minimize damage caused by wild animal species, including threatened and endangered species, to agriculture, horticulture, animal husbandry, forestry, wildlife, and human health, safety or other property, and 2) facilitate exchange of information. This MOU allows Tennessee agencies concerned with protection of resources and public health to collaborate with WS in programs in Tennessee to achieve mutual objectives. WS consults with these various agencies from time to time in the process of assisting Tennessee residents in resolving wildlife damage conflicts, and these agencies refer appropriate wildlife damage complaints to WS.

2.0 CHAPTER 2 - ISSUES

Chapter 2 contains a discussion of the issues, including issues that will receive detailed environmental effects analysis in Chapter 4 (Environmental Consequences), issues that have driven the development of mitigation measures and/or standard operating procedures, and issues that will not be considered in detail, with rationale. Pertinent portions of the affected environment will be included in this chapter in the discussion of issues used to develop mitigation measures. Additional description of affected environments will be incorporated into the discussion of the environmental effects in Chapter 4.

2.1 SUMMARY OF ISSUES

The following issues have been identified as areas of concern requiring consideration in this EA. These will be analyzed in detail in Chapter 4:

- Effects on Wildlife Including Target and Nontarget Species and T&E Species
- Effects on Human Health and Safety
- Effects on Socio-economics of The Human Environment
- Effects on Wetlands

2.2 ISSUES ADDRESSED IN THE ANALYSIS OF ALTERNATIVES

2.2.1. Effects on Wildlife

2.2.1.1 Effects on Target Bird Species Populations

A common concern among members of the public is whether wildlife damage management actions adversely affect the viability of target species populations (see Section 1.2). The target species selected for analysis in this EA are the primary ones which may be affected by WS's BDM activities in Tennessee which are species of which more than just a few individuals would likely be killed by WS's use of lethal control methods under the proposed action in any single year. Those species include European starlings, feral domestic pigeons, and English sparrows. These three species are all nonnative exotics. Other species that have been killed in relatively low numbers include great blue herons (an annual average of 24 was killed during FY 1999-2001), mourning doves (an annual average of 607 was taken during FY 1999-2001), and vultures (an average of 204 per year was taken during FY 1999-2001).

2.2.1.2 Effects on Nontarget Species populations, including T&E Species

A common concern among members of the public and wildlife professionals, including WS personnel, is the impact of damage control methods and activities on nontarget species, particularly T&E Species. WS's standard operating procedures include measures intended to mitigate or reduce the effects on nontarget species populations and are presented in Chapter 4.

Special efforts are made to avoid jeopardizing Threatened and Endangered Species through biological evaluations of the potential effects and the establishment of special restrictions or mitigation measures. WS has consulted with the USFWS under Section 7 of the Endangered Species Act (ESA) concerning potential effects of BDM methods on T&E species and has obtained a Biological Opinion (B.O.). For the full context of the B.O., see Appendix F of the ADC FEIS (USDA 1997, Appendix F). WS is also

in the process of reinitiating Section 7 consultation at the program level to assure that potential effects on T&E species have been adequately addressed.

Some nontarget species may actually benefit from BDM. Prime examples are the benefit to native cavity nesting bird species that results from any reduction in starling populations or the benefit to a number of bird species, including some T&E species, that results from reductions in populations of brown-headed cowbirds which parasitize nests of other birds.

2.2.2 Effects on Human Health and Safety

2.2.2.1 Safety and Efficacy of Chemical Control Methods.

The public is sometimes concerned about chemicals used in bird control programs because of potential adverse effects on people from being exposed either to the chemicals directly or to birds that have died as a result of the chemical use. Under the alternatives proposed in this EA, the primary toxicant proposed for use by WS is DRC-1339 (Starlicide), which would be primarily used to remove feral domestic pigeons and European starlings or blackbirds in damage situations. DRC-1339 use is regulated by the EPA through FIFRA, by Tennessee State Pesticide Control Laws, and by WS Directives. Another chemical method that could be used is Avitrol which is classified as an avian distressing agent and is normally used to deter target bird species from using certain problem areas. Other chemicals available for use include the tranquilizer Alpha-chloralose (for live-capturing nuisance waterfowl and pigeons) anthraquinone (Flight Control), and methyl and di-methyl anthranilate (artificial grape flavoring, which also has bird repellent capabilities).

2.2.2.2 Effects on Human Health And Safety From Non-chemical BDM Methods

Some people may be concerned that WS's use of firearms and pyrotechnic bird scaring devices could cause injuries to people. WS personnel occasionally use small caliber firearms, air guns (air rifles and air pistols), and shotguns to remove or scare birds such as roosting European starlings and blackbirds, and feral domestic pigeons that are causing damage. Shotguns may also be used on airports to scare or remove birds which pose a threat to aircraft or air passenger safety. WS frequently uses pyrotechnics in noise harassment programs to disperse or move birds. There is some potential fire hazard to private property from pyrotechnic use. In Tennessee, during FY 1999-2001, WS conducted 434 BDM events using firearms or air guns which involved the discharge of thousands of projectiles without any injuries occurring. Similarly, 370 pyrotechnic events were conducted aimed at harassment of various birds during the same period without any accidents.

2.2.2.3 Effects on Human Health And Safety From Not Conducting BDM to Reduce Human / Aggressive Bird Confrontations, Disease Threats or Outbreaks And Bird Strike Hazards at Airports

The concern stated here is that the absence of adequate BDM would result in adverse effects on human health and safety, because attacks on humans by some birds, especially nesting Canada geese, the transmission of bird-borne diseases, and bird strikes on aircraft would not be reduced to acceptable levels. In Tennessee, WS conducts at least thirty six projects annually to address human health and safety concerns at business facilities, private property, or for Local governments. At some sites, nesting Canada geese have been observed to attack employees or patrons. Such attacks can lead to

human injury, expensive medical bills, and lawsuits. At other sites, property managers are concerned about sanitation where birds have deposited droppings and litter.

Sites where roosting birds, such as European starlings and blackbirds, have deposited considerable quantities of droppings are viewed as unacceptably filthy. In addition, such locations are likely to harbor infective levels of *Histoplasma capsulatum*, posing a threat of disease to humans (Stickley and Weeks 1985) or *Cryptococcus neoformans* (U.S. Environmental Hygiene Agency 1992), as discussed in Subsection 1.3.2. Many cases of subclinical histoplasmosis are associated with sites known to have infective levels of the organism (Kentucky Epidemiological Notes & Reports, 1992). Part of programs to sanitize such sites includes reducing the use of the area by birds.

Property managers fear that the absence of the WS BDM could mean that birds would continue to use these areas and humans would still be at risk for bird-caused injuries or diseases.

As discussed in Subsection 1.3.3, WS frequently assists airports in Tennessee who seek to resolve wildlife hazards to air passengers. Airport managers and air safety officials are concerned that the absence of a WS BDM could lead to failure to be able to adequately address the complex wildlife hazard problems faced by these facilities. Hence, potential effects of not conducting such work could lead to an increased incidence of injuries or loss of human lives from bird strikes to aircraft.

2.2.3 Effects On Socio-cultural And Economics of The Human Environment

2.2.3.1 Effects on Human Affectionate-Bonds With Individual Birds And on Aesthetic Values of Wild Bird Species

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 and/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. Many people do not develop emotional bonds with individual wild animals, but experience aesthetic enjoyment from observing them.

Public reaction to damage management 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.

The public's ability to view wild birds in a particular area would be more limited if the birds are removed or relocated. However, immigration of birds from other areas could possibly replace the animals removed or relocated during a damage management action. The opportunity to view or feed other wildlife would also 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. In addition, WS BDM actions rarely remove all birds or even all birds of one species from a locale where actions occur. Sometimes the live capture and translocation of Canada geese or mallard ducks result in the complete removal of all of these birds from one pond, but adjacent ponds in nearby neighborhoods still contain other

geese and ducks. In most instances in Tennessee where WS conducts such activities, other geese and ducks are observed to fly into the project area before WS employees depart with captured birds. There are also occasions when WS intentionally leaves a few birds, although they could be captured. This usually occurs when such a request has been made by an interested citizen and when those requesting service do not object.

Some people do not believe that geese, or nuisance blackbird or starling roosts should even be harassed to stop or reduce damage problems. Some of them are concerned that their ability to view birds is lessened by WS nonlethal harassment efforts.

Some individuals are offended by the presence of English sparrows, blackbirds, and European starlings. To such people these species represent pests which are nuisances and intruders into the natural order in the United States and sowers of diseases transmissible to humans. Their overall enjoyment of other birds is diminished by what they view as a destructive presence of such species. They are offended that such birds proliferate in such numbers and appear to remain unchecked.

2.2.3.2 Effects on Aesthetics and Value of Property Damaged by Birds

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 turf. 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 geese, loss of customers or visitors irritated by the odor of, or of having to walk on, fecal droppings, repair of golf greens, replacing grazed turf, and loss of time contacting local health departments and wildlife management agencies on health and safety issues.

2.2.4 Humaneness and Animal Welfare Concerns of Methods Used by WS

The issue of humaneness and animal welfare, as it relates to the killing or capturing of wildlife is an important but 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 . . . "* (AVMA 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 . . . "* (CDFG 1991), such as shooting.

Defining pain as a component in humaneness of WS methods 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 . . . "* (AVMA 1987). However, pain experienced by individual animals probably ranges from little or no pain to considerable pain (CDFG 1991).

Pain and suffering, as it relates to WS 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 or veterinary curricula explicitly address suffering or its relief"* (CDFG 1991).

Therefore, humaneness, in part, appears to be a person's perception of harm or pain inflicted on an animal, and 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 and humaneness of management techniques through research and development. Research is continuing to bring new findings and products into practical use. Until new findings and products are found practical, a certain amount of animal suffering could occur when some BDM methods are used in situations where nonlethal damage management methods are not practical or effective.

Tennessee WS personnel are experienced and professional in their use of management methods so that they are as humane as possible under the constraints of current technology, workforce and funding. Mitigation measures/SOPs used to maximize humaneness are listed in Chapter 4.

2.3 ISSUES CONSIDERED BUT NOT IN DETAIL WITH RATIONALE

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 Tennessee would meet the NEPA requirements for site specificity. Wildlife damage management falls within the category of Federal or other agency actions in which the exact timing or location of individual activities cannot usually be predicted well enough ahead of time to accurately describe such locations or times in an EA or EIS. The WS program is analogous to other agencies or entities with damage management missions such as fire and police departments, emergency clean-up organizations, insurance companies, etc. Although WS can predict some of the possible locations or *types* of situations and sites where some kinds of wildlife damage will occur, the program cannot predict the specific locations or times at which affected resource owners will determine a bird damage problem has become intolerable to the point that they request assistance from WS. Nor would WS be able to prevent such damage in all areas where it might occur without resorting to destruction of wild animal populations over broad areas at a much more intensive level than would be desired by most people, including WS and State agencies. Such broad scale population control would also be impractical, or impossible, to achieve.

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 effects, one EA analyzing impacts for the entire State may provide a better analysis than multiple EA's covering smaller zones.

2.3.3 Effects On Public Use of Migratory Birds

Many migratory bird species offer enjoyment to bird watchers and hunters and provide a significant economic contribution in Tennessee. During 1996, more than 700,000 people participated in activities

such as wildlife watching and hunting of migratory birds in the State. In pursuit of recreation related to photographing, feeding, watching, and hunting migratory birds, they contributed more than $219 million to the economy of the State for expenses related to travel, equipment, feed, licenses, wildlife club membership and other associated costs (USDI-FWS-USDC 1996). Because migratory birds are such a substantial economic and recreational resource, there may be concerns that WS BDM actions related to managing damage by migratory birds, especially waterfowl, might negatively affect these factors.

Almost all BDM activities during FY 1999-2001 which involved waterfowl occurred in cities and towns or recreational areas where hunting is forbidden by municipal statute. Waterfowl were live-captured through various approved methods and translocated to wild sites mutually agreed upon between TWRA and WS. The primary objective in these translocation projects is to distribute waterfowl in such a manner as to mitigate the problem, while benefitting the waterfowl, people, and potentially providing recreational opportunity to the public.

Exceptions to live capture and translocation of waterfowl in the Tennessee BDM program occur in relation to waterfowl on airports. Sometimes such birds are killed when air passenger safety is threatened. Only a few waterfowl are killed each year on airports in Tennessee by WS. During FY 1999-2001 WS killed an annual average of 13 Canada geese and 13 wild ducks (Table 5.1) in all BDM programs in the State.

Mourning doves are also addressed in BDM programs throughout the State. WS killed an average of 607 mourning doves each year during FY 1999-2001 in all BDM activities in Tennessee (Table 5.1). Most of these birds are killed in harassment/shooting activities. Mourning dove populations are very healthy in the U. S. and no difficulty related to scarcity of the species is encountered in watching or hunting them. Population information and environmental consequences of WS BDM actions related to mourning doves in Tennessee are discussed in Subsection 5.1.1.1.

2.3.4 WS's Effect on Biodiversity

The WS program does not attempt to eradicate any species of wildlife in Tennessee. WS operates in accordance with international, Federal and State laws, and regulations enacted to ensure species viability. Effects on target and nontarget species populations because of WS's lethal BDM activities are minor as shown in Section 5.1. The effects of the current WS program on biodiversity are not significant nationwide or statewide (USDA 1997). In the case of local populations of nonnative species such as feral domestic pigeons, the goal may be to eliminate a local population but because such species are not part of the mix of native wildlife species, they are not an essential component of the native biodiversity. Rarely, if ever, would BDM result in the long term local elimination of even these nonnative species, however.

2.3.5 Wildlife Damage is a Cost of Doing Business -- a "Threshold of Loss" Should Be Established Before Allowing Any Lethal Bird Damage Management.

WS is aware that some people feel Federal wildlife damage management should not be allowed until economic losses reach some arbitrary predetermined threshold level. Such policy, however, would be difficult or inappropriate to apply to human health and safety situations. Although some damage can be tolerated by most resource owners, WS has the legal direction to respond to requests for assistance,

and it is program policy to aid each requester to minimize losses. WS uses the Decision Model thought process discussed in Chapter 4 to determine appropriate strategies.

In a ruling for Southern Utah Wilderness Alliance, et al. vs. Hugh Thompson, Forest Supervisor for the Dixie National Forest, et al., the United States District Court of Utah denied plaintiffs' motion for preliminary injunction. In part the court found that a forest supervisor needs only show that damage from wildlife is threatened, to establish a need for wildlife damage management (Civil No. 92-C-0052A January 20, 1993). Thus, there is judicial precedence indicating that it is not necessary to establish a criterion such as percentage of loss of a particular resource to justify the need for wildlife damage management actions.

2.3.6 Wildlife Damage Management Should Not Occur at Taxpayer Expense, But Should Be Fee-Based

WS is aware of concerns that wildlife damage management should not be provided at the expense of the taxpayer, or that it should be fee-based. WS was established by Congress as the agency responsible for providing wildlife damage management to the people of the United States. Funding for WS comes from a variety of sources in addition to Federal appropriations. Such non-Federal sources include State general appropriations, Local government funds (county or city), livestock associations, Indian tribes, and private funds which are all applied toward program operations. Federal, State, and Local officials have decided that some BDM by WS should be conducted by appropriating funds. Additionally, wildlife damage management is appropriate for government programs, since wildlife management is a government responsibility. A commonly voiced argument for publicly funded wildlife damage management is that the public should bear responsibility for damage to private property caused by public wildlife.

A minimal Federal appropriation is allotted for the maintenance of a WS program in Tennessee. The remainder of the WS program is entirely fee-based. Technical assistance is provided to requesters as part of the Federally-funded activities, but all direct assistance in which WS employees perform damage management activities is funded through cooperative agreements between the requester and WS. Thus, BDM by WS in Tennessee is fee-based to a high degree.

2.3.7 Cultural Resource Concerns

The National Historic Preservation Act (NHPA) of 1966, 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. WS BDM actions do not cause ground disturbances nor do they otherwise normally have the potential to affect visual, audible, or atmospheric elements of historic properties and are thus not undertakings as defined by the NHPA. 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 arose with the use of historic properties.

2.3.8 Environmental Justice And Executive Order 12898 - *"Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations."*

Environmental Justice (EJ) 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. EJ, 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.

EJ is a priority both within APHIS and WS. Executive Order 12898 requires Federal agencies to make EJ 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 EJ. WS personnel use wildlife damage management methods as selectively and environmentally conscientiously as possible. It is not anticipated that the proposed action would result in any adverse or disproportionate environmental effects to minority and low-income persons or populations.

2.3.9 Lethal BDM For Blackbirds And European Starlings Is Futile Because 50-65% of Them Die Each Year Anyway

Because natural mortality in blackbirds populations is 50 - 65% per year (see Subsection 5.1.1.1), some persons argue that this shows lethal BDM actions are futile. However, the rate of natural mortality has little or no relationship to the effectiveness of lethal BDM because natural mortality generally occurs randomly throughout a population and throughout the course of a year. Natural mortality is too gradual in individual concentrations of depredating birds to adequately reduce the damage that such concentrations are causing. It is probable that mortality caused by BDM actions is not additive to natural mortality but merely displaces it as "compensatory" mortality (Bailey 1984). In any event, it is apparent that the rate of mortality from BDM is well below the extent of any natural fluctuations in overall annual mortality and is, therefore, insignificant to national or eastern U.S. populations. Population estimates and trends for European starlings and blackbirds in the U.S. and for the eastern U.S. are discussed in Subsection 5.1.1. The objective of lethal BDM in Tennessee is not to necessarily add to overall blackbird or starling mortality, which would be futile under current funding limitations, but to redirect mortality to a segment of the population that is causing damage in order to realize benefits during the current production season. The resiliency of these bird populations does not mean individual BDM actions are not successful in reducing damage, but that periodic and recurring BDM actions are necessary in many situations.

2.3.10 Cost Effectiveness of BDM

Perhaps a better way to state this issue is by the question "Does the value of damage avoided equal or exceed the cost of providing BDM?" The Council on Environmental Quality (CEQ) regulations (40 CFR 1502.23) do not require a formal, monetized cost-benefit analysis to comply with NEPA. Consideration of this issue is not essential to making a reasoned choice among the alternatives being considered. The ADC EIS, Appendix L, p. 32 (USDA 1997) stated:

Cost effectiveness is not, nor should it be, the primary goal of the APHIS WS program. Additional constraints, such as environmental protection, land management goals, and others, are considered whenever a request for assistance is received. These constraints increase the cost of the program while not necessarily increasing its effectiveness, yet they are a vital part of the APHIS WS program.

An analysis of cost-effectiveness in many BDM situations is exceedingly difficult or impossible to perform because the value of benefits is not readily determined. For example, the potential benefit of eliminating feral domestic pigeons from roosting and nesting around heating and cooling structures on a school or hospital could be reduced incidences of illness among unknown numbers of building users. Since some of the bird-borne diseases described in Chapter 1 are potentially fatal or severely debilitating, the value of the benefit may be high. However, no studies of disease problems with and without BDM have been conducted, and, therefore, the number of cases *prevented* by effective BDM is not possible to estimate. Also, it is rarely possible to conclusively prove that birds are responsible for individual disease cases or outbreaks.

The WS program in Arizona prepared an analysis of cost vs. avoided loss for feedlot and dairy operations that received BDM service. The analysis indicated that the value of feed saved from blackbird and starling damage by BDM with DRC-1339 exceeds the cost of the service by a factor of three-to-one, without considering other benefits such as prevention of disease transmission, restored weight gain performance, and milk yields (USDA 1996). A similar analysis in Idaho yielded a ratio of avoided losses to cost of about four-to-one (USDA 1998a). Although not available for Tennessee feedlots and dairies, because this type of BDM has been extremely limited, the Arizona and Idaho analyses indicate blackbird and starling control at dairies and feedlots is cost-effective.

2.3.11 Protection of Children from Environmental Health and Safety Risks (Executive Order 13045)

Children may suffer disproportionately from environmental health and safety risks for many reasons. BDM as proposed in this EA would only involve legally available and approved damage management methods in situations or under circumstances where it is highly unlikely that children would be adversely affected. Therefore, implementation of the proposed action would not increase environmental health or safety risks to children.

3.0 CHAPTER 3: OBJECTIVES

Chapter Three examines objectives of the BDM program in Tennessee. The Government Performance and Results Act of 1993 requires that Federal agencies develop program strategies and set goals which are measurable. Further, entities which cooperate with WS in BDM projects have developed objectives related to resolving wildlife damage. These goals may be driven by policy, governmental regulation, welfare of employees and the public, corporate image, customer satisfaction, or a combination of any of these. WS pursues goals related to wildlife damage management as set forth in the WS programmatic Strategic Plan (USDA - APHIS - ADC, 1989). Such goals may be reflected in local and state level wildlife damage management programs conducted by WS throughout the United States. Goals discussed in this EA reflect the most reasonable outcome of an effective BDM program in which Cooperators and WS participate.

3.1 SUMMARY OF OBJECTIVES

Wildlife Services will measure achievement of objectives for BDM Direct Assistance programs in Tennessee by attaining and/or maintaining an "adequate grade," as defined in section 3.3 and 3.4 for a set of defined objectives presented below:

- Reductions In Bird-caused Human Health And Safety Incidents And/Or Maintenance Of Previously Attained Reductions Calculated As Damage Losses Averted Or Resources Saved
- Reductions In Damage To Agriculture Caused By Birds And/Or Maintenance Of Previously Attained Reductions Calculated As Damage Losses Averted Or Resources Saved
- Reductions In Damage To Property Caused By Birds And/Or Maintenance Of Previously Attained Reductions Calculated As Damage Losses Averted Or Resources Saved
- Reductions In Damage To Natural Resources Caused By Birds And/Or Maintenance Of Previously Attained Reductions Calculated As Damage Losses Averted Or Resources Saved

3.2 DESCRIPTION OF OBJECTIVES

In this section objectives of the proposed action are discussed and ways that achievement of these objectives will be measured are presented. Measurement of success in wildlife damage management projects is usually difficult, often subjective, and dependent on sometimes variable objectives . The purpose of this discussion is to inform the public regarding views about damage caused by birds, and expectations, or objectives of both WS and those who participate with WS in programs to reduce that damage.

3.2.1 Reductions In Damage To Agriculture

Farming continues to dominate Tennessee's landscape with approximately 91,000 farms producing and selling crops, livestock, and forest products. Forty-five percent of the state's land area is in farmland (Tennessee Agricultural Statistics 2001). Tennessee's top agricultural products include cattle and calves, broilers, hardwood lumber, dairy products, tobacco, cotton, nursery products, soybeans, corn, fruits and vegetables, wheat, and hogs. Agricultural production alone, excluding forest products, normally generates around $ 2 billion annually in farm cash receipts (Tennessee Agricultural Statistics 2001). WS has received requests for assistance related to damage by birds to several of these resources in the past. Some examples are blackbird and Canada goose damage to

wheat, corn, soybeans, and hay; vulture predation on piglets and calves; disease threats to poultry operations and cattle from foraging and loafing European starlings and Canada geese (USDA-WS MIS Database). Complainants sometimes feel that their livelihoods are threatened and have usually tried unsuccessfully to resolve such damage through various self-help techniques. Reducing damage to resources is often considered by farmers as necessary to insure an adequate income or to avoid serious problems with farm operations. The aim of WS BDM programs will be to provide solutions to bird damage situations which will allow agricultural producers to obtain a net gain in production as a result of a reduction in bird damage. Prudent measures for reducing or eliminating bird-caused damage will be recommended to requesters or implemented by WS in direct assistance programs. Such activities may include any of the approved methods summarized in Subsection 4.2.4., and may be directed toward resolving damage caused by any bird species including, but not limited to, those listed in Subsection 1.2.

3.2.2 Reductions In Bird-caused Human Health And Safety Incidents

A number of complainants who seek assistance from WS regarding real or potential threats to human health and safety are usually concerned with unsanitary conditions created by excessive deposits of bird droppings. Although most people are not very familiar with diseases associated with bird roosts where droppings abound they feel uncomfortable or threatened by the filth and perceived threats. Some individuals seem informed about potential diseases and discuss them readily. More than 80% of calls for assistance with bird problems in urban areas of Tennessee are the result of concerns for threats to human health and safety (USDA-WS MIS Database). Some complaints related to human health and safety are also made because birds are creating fire hazards by building nests around electrical wires and lighting, or because birds such as adult Canada geese are being aggressive toward humans (USDA-WS MIS Database).

Birds pose considerable threats to air passenger safety at airports (USDOT 1997). Although very few flights result in plane crashes and the death of those aboard, some people are apprehensive about flying because of the threat of a bird/aircraft strike. For them resolution of threats to aircraft traffic posed by birds at airports is very important. WS receives several requests each year from airport managers for assistance in resolving damage threats posed by birds as part of their program to insure safety at airports.

Resolving bird damage of this nature is the primary goal of both those experiencing damage and WS. Programs are tailored to achieve this end, and cooperators and WS actively participate in various increments of a project. Such activities may include any of the approved methods summarized in Subsection 4.2.4, and may be directed toward resolving damage caused by any bird species including, but not limited to, those listed in Subsection 1.2.

3.2.3 Reductions In Damage To Property Caused By Birds

During FY 1999 - 2001 average annual property related losses to bird damage in Tennessee exceeded $465,000 per year (USDA-WS MIS Database). Types of property damaged included residential and non-residential buildings, lawn furniture, sidewalks, landscape ornamentals and shrubs, vegetable gardens and fruit on backyard trees, pets, aircraft, beaches, equipment and machinery, electrical utilities, bridges, and recreational beaches, to name a few (USDA-WS MIS Database). Sometimes damages could be rectified through cleaning damaged property, or repairing it, as in cases where excessive bird droppings fouled clothing, lawn furniture, sidewalks or structures,

caused the degradation of painted surfaces, or where bird strikes to aircraft damaged components of the airplane. Such repair or cleanup costs are sometimes factored in as part of the damage values. Damage resulting from bird consumption of garden products or fruits was irreconcilable and costs of replanting or purchasing what was grown at a commercial source may have been factored into the loss value. These loss values represent real investments by persons who experienced damage. That segment of the public which contacts WS regarding damage to property usually have specific objectives in mind. These objectives always include eliminating damage, or reducing it to acceptable levels. WS works with individuals and entities to design professional and responsible programs based on sound wildlife management to address such damage. Methods developed for implementation to reduce or eliminate damage to property may include any of the approved methods summarized in Subsection 4.2.4 and may be directed toward resolving damage caused by any bird species including, but not limited to, those listed in Subsection 1.2.

3.2.4. Reductions In Damage To Natural Resources Caused By Birds

Natural resource damage by birds in Tennessee consists of, but is not limited to, incidents such as predation on game fish or fry at sites such as State fish hatcheries and private aquaculture facilities; predation on endangered species as discussed in Subsection 1.3.7., or tree damage from accumulations of droppings. Other instances are raptor predation on songbirds at backyard bird feeders, and woodpecker damage to trees in natural areas. Natural resource managers and the public are often concerned with total elimination of such damage because natural resources are often viewed as rare, and some are unrenewable. WS cooperates with individuals seeking resolution of damage to natural resources in programs which are often designed on a case by case basis because of the frequently unique nature and setting of such damage. Consideration for preserving other valuable resources is often requisite to such damage management activities. For instance, WS participated with [redacted] and [redacted] to conduct a program to protect California least terns (*Sterna antillarum brownii*), an endangered species, from predation by peregrine falcons, another endangered species (B. Dunlap WS, Pers. Comm. 2000). A complex program was necessary in order to accommodate both species while seeking the preservation of one. Such programs have specific guidelines and objectives with measurable results. WS may develop other programs in Tennessee to address bird damage to natural resources in the future. Such activities may include any of the approved methods summarized in Subsection 4.2.4, and may address damage by any bird species including, but not limited to, those listed in Subsection 1.2.

3.3 METHODS FOR MEASURING ACCOMPLISHMENTS OF OBJECTIVES IN DIRECT ASSISTANCE PROGRAMS

All BDM program objectives discussed have reductions in damage as a common denominator. However, quantifying levels of reductions in damage, or documenting degrees of reduction in damage is sometimes difficult. Participants with WS in BDM programs often are not familiar with attaching dollar loss values to previously existing damage, and records of costs related to attempts to deal with bird damage are poorly kept. For that reason, historical loss values are sometimes missing and WS derives only current loss values when a site is inspected during damage evaluation activities. This situation is further complicated by the fact that no scientifically based method for standardizing calculations of losses related to human health and safety threats exist. Valuable information about dollar costs to the public regarding human health and safety threats, or actual damage or death to humans, may not be reported because of the absence of established loss values. However, some factors related to expectations of cooperators regarding damage

abatement may be used to provide acceptable indicators of accomplishment in BDM programs. In addition, factors measurable by WS can serve to supplement or further validate those indicators.

Losses in general are often thought of in terms of what is damaged or destroyed when birds become a problem. Such things as acres of crops or pounds of fish eaten, or damages to airplanes resulting from bird strikes are concrete losses which are directly apparent. However, other losses just as meaningful are financial costs for equipment replacement, repair, medical costs for injuries or disease, cost of seeds for replanting of crops, cost of cleaning areas damaged by bird droppings, and many others. There are also often collateral costs which are an outgrowth of bird damage, or subsequent efforts to address it. These latter two types of indirect losses are often overlooked. Losses of this nature, such as lost time because of work stoppages, extra man hours required to address incidents which occur as a result of bird damage, loss in yields because of later replanting of crops, or reduction of egg production among hens because of a chronic disease transmitted by birds may account for an excessive quantity of total losses occurring as a result of bird damage. For the purposes of this EA, WS will define damage losses in the following ways:

A. Losses directly related to the presence of damaging birds such as, but not limited to:

- Birds consuming field crops or contaminating and rendering unusable a measurable quantity of stored grain or livestock feed
- The death of trees as a result of excessive droppings deposited in a roost site
- The consumption of fish by predaceous birds
- Birds of prey killing songbirds, livestock, pets or threatened or endangered species
- A bird strike to an airplane which damages the plane or injures or kills people
- Increased man hours or material for cleanup or repair of damage caused by birds
- Costs of BDM programs or techniques for reducing or eliminating the damage posed by birds

B. Losses indirectly related to the presence of damaging birds such as, but not limited to:

- Veterinary costs and husbandry costs for animals infected or infested by bird- borne diseases, or parasites
- Decreased production among livestock as a result of the presence of a disease introduced by birds
- Reduced yield in crops because of late replanting where birds have destroyed or caused damage to such crops
- Medical costs and lost days of work associated with contraction and treatment of bird-borne diseases among humans

3.3.1 Qualitative Methods

3.3.1.1 Cooperator Assessment Of Work Plan Accomplishments As A Measure Of Achieving Objectives

Communications between cooperators and WS during implemented programs are evolving processes in which information is shared about progress, problems and contingencies. Through the process both parties have opportunity to develop possible changes in program activities, address safety and protocol issues, and obtain further information about each other's roles. Cooperators also have opportunity to critique and grade a program's effectiveness. This input

by cooperators will be used to determine efficacy of damage reductions by WS in BDM programs. WS personnel may gather this information during visits to the project site; during discussions with the cooperator, or through voluntary written information provided by the cooperator. Present Federal restrictions prohibit WS from conducting customer satisfaction surveys. However, informal gathering of such information can be done and documented by the local WS Office.

In direct assistance BDM programs WS presents cooperators with some kind of work plan outlining what will be done during a project. Descriptions may include what damage will be addressed and by what means, and what species will be addressed as well as site specific procedures. These work plans are designed with consideration for cooperator needs, WS policy and procedure, best management practices for the specific project, and sound wildlife management practices. To obtain a measurement of objectives for a BDM program, WS will categorize opinions of Cooperators about effectiveness into the following numeric rating groups of 0 or 1:

A. Adequate (rating of 1): Cooperator opinions gathered by verbal or written communication and kept on file in WS records on that project will fit this category when the cooperator makes a statement that affirms that a program has been successful in resolving totally, or in an acceptable part, the damage related to the species being addressed. Normally this input will be sought from the primary contact person the cooperator has assigned.

Most BDM projects in the Tennessee WS program are dated and last for one year or less. Often cooperators request the renewal of such programs under new cooperative agreements at or near the expiration date of such agreements. WS will interpret the request by a cooperator for a renewal of the program as a grade of "adequate" and an indicator that the program has satisfactorily achieved damage reduction objectives.

Some BDM programs in Tennessee are requested because cooperators have sought a continuation of such projects in anticipation of a recurrence of damage factors which have historically been very costly. In some instances, such as the recurrence of human health and safety threats and damage to property by feral domestic pigeons and Europeans starlings and blackbirds, cessation of programs by WS has resulted in damage levels returning to pre-program proportions in less than three years. In such instances, cooperators are concerned with reducing damage to acceptable levels during initial programs, and maintaining those reductions in subsequent programs. This will be a factor used to determine accomplishment of objectives in BDM programs in Tennessee where cooperators have indicated, and WS has concluded, that initial objectives have been met but new programs have been requested. When other programs are negotiated by cooperators to retain damage reduction levels previously gained, statements by them about that maintenance will be indicators that the objectives were met. In subsequent programs, where maintaining the reduced damage levels previously achieved are an objective, statements by cooperators which indicate that an acceptable level of damage reduction has been maintained will be used as evidence of achievement of objectives. These ratings will become part of the grading process outlined in this Section of which an example is presented in Table 3-1.

B. Inadequate (rating of 0): Statements by cooperators indicating that acceptable damage reduction levels were not achieved or maintained will be placed on record at the local WS office

to indicate less than satisfactory achievement of objectives for that BDM program as measured by cooperator opinion. Such statements may be records of verbal communication with the cooperator by the BDM program specialist or the supervisory biologist or may be written documentation by the cooperator. These ratings will become part of the grading process outlined in this Section of which an example is presented in Table 3-1.

3.3.2 Quantitative Methods

3.3.2.1 Observed / Calculated Damage Reductions As A Measure Of Achieving Objectives

Damage assessments by WS personnel are usually conducted when visiting a damage site and developing recommendations for solutions. Since these assessments usually occur before any work is done at a site, WS will use such evaluations to derive benchmark values for bird damage losses, which might occur without intervention of direct assistance programs. Such values may be used for site-specific reference or may be used to establish indices for similar bird damage projects.

Using damage loss values for site specific determination as to whether or not objectives have been met will be accomplished by comparing time-framed loss values before damage management activities began with time-framed loss values during or immediately following a BDM program. For instance, losses incurred by a cooperator during a one year interval prior to WS activities could be calculated, and one-year losses occurring during, or following, a WS implemented BDM program could be compared. If latter losses for a comparable time interval are less than former losses, the project will be given an adequate rating (rating of 1). If this is not the case and the latter losses are greater than, or equal to, the former losses an inadequate rating (rating of 0) will be given.

The following rules may be used by WS to obtain benchmark and comparison data:

- WS BDM program managers may use any reasonable time-frame for damage-loss value calculations, but pre- and post-time frames will be equal in the number of days being evaluated. Blocks of time used for calculations could be any time frame from a few days to one year. This would depend on the length of time cooperators have tracked losses, what elements of loss have been tracked, and length of a BDM program implemented, or length of time a BDM program continues through cooperative agreement renewals.

- WS BDM program managers may use any component of a specific project to calculate losses for analysis and conclusions. For instance, if WS conducts a county-wide program to protect agricultural crops from damage by Canada geese, the BDM program manager may use only seedling corn as the indicator crop if that is the primary protected crop and is the primary target of Canada geese for the county. Further, if only one farmer's corn crop is being damaged in that county, the WS BDM program manager may use that farmer's crops to measure damage and use the county average corn yield as a benchmark for comparison of losses.

3.3.2.2 Observed / Calculated Resources Saved As A Measure Of Achieving Objectives

As discussed earlier in this section, cooperators sometimes request and receive WS BDM services to protect resources because historical evidence related to their projects demonstrates that during periods of time in which no BDM activities are conducted, damage by birds increases to unacceptable proportions. In these continuing programs, previous time-framed damage-loss values may be outdated or unavailable. In these instances, WS often establishes the saving of resources as objectives either in work plan outlines or in communications with cooperators. Saving resources which might otherwise be lost to damage by wildlife is an important priority to many resource managers who cooperate with WS. In addition, this aspect of agency mission objectives is considered by some to be pivotal to sound wildlife damage management (C. Brown, WS-ERO and [redacted] WS-UT, Pers. Comm. 1999). Resources saved might be viewed as that component of resources which are not destroyed, threatened, or reduced in value by the activity of damaging wildlife, or that portion of resources, such as manpower, equipment, material, or effort not expended to combat losses to wildlife. Projects that result in the saving of any resources that would have been lost without a BDM program will be given an adequate rating (rating of 1). Those projects that do not meet this criterion will be given an inadequate rating (rating of 0). Resources saved as a result of BDM programs in Tennessee may be used by some WS program managers as a component for determining whether objectives are achieved.

In order to appropriately determine resources saved in BDM programs, it is essential to identify the nature of damage to certain resources, and the way that such damage can occur. For instance, the presence of a flock of birds on the runway of an airport, during times when flights are arriving or departing, presents a threat to both aircraft and occupants therein (USDOT 1997) although no damage has yet occurred. Again, the presence of a chronic bird roost in a neighborhood can provide an environment beneath the roost for the development of the infectious fungal agent *Histoplasma capsulatum* and provide a histoplasmosis threat to the local residents. Although no case of histoplasmosis occurring among residents may be directly linked to the roost site, simply because the microscopic spores that cause the disease cannot be tracked, health professionals acknowledge that a threat of the disease exists for humans in the immediate area (Kentucky Epidemiological Notes & Reports, 1992). In both of these examples the resource is human health and safety and the damage is a safety or disease threat. It follows then, that if a BDM action or program disperses a flock of birds from a runway and thereby eliminates the threat to the safety of 250 air passengers, or disperses a flock of birds from a chronic residential roost where histoplasmosis may be a threat to 100 residents, both programs may be evaluated for resources saved. On the one hand, the airport action preserved 250 human lives from a potential safety threat and on the other, the residential action preserved 100 human lives from a potential health threat. WS addresses resource protection with consideration for such potential damage, and in calculating what resources are saved as a result of BDM programs this kind of damage will be factored into deriving conclusions about achieving objectives.

Determining the value and quantity of resources saved as a result of BDM programs becomes more straightforward when known losses can be calculated from historical data about a site where bird damage has occurred. However it is an extremely complicated issue, primarily because indices for resources lost during periods of no BDM activities are often incomplete or lacking and changes in the value or quantity of a managed resource are sometimes continuous. For example, the number of human lives protected by a BDM program at an airport that scares birds from the vicinity of runways changes from hour to hour and day by day. Again, a resource such as an agricultural crop changes in value by the season and amount of effort expended by the farmer to tend it. There are however, some instances in which known resources are expended or lost in the absence of BDM activities and these can be compared to the same or similar resource savings or

losses during BDM programs to derive values for resources saved. An example might be a situation where a utility power company expended 200 additional man hours for two consecutive years to replace transformers destroyed by electrical shorts resulting from roosting birds on power lines, but when a BDM program was instituted, no bird-caused outages or destroyed transformers occurred during the year-long program. The following year another BDM program was initiated and records of the utility company showed that again, no additional man-hours were expended resolving outages caused by birds for the second year. It follows that 400 man hours, or their dollar equivalent, represented resources saved by the utility company. Likewise, during a BDM project to reduce human health and safety threats arising from roosting European starlings at a factory, the WS program manager may select the number of employee-hours that workers had to work on surfaces fouled with bird droppings before initiation of a project and compare this to the same number of employee-hours that workers had to work on surfaces fouled with droppings within a duplicate time interval during, or following, a BDM program. The WS BDM program manager might also choose to count the number of employees who were exposed to accumulations of bird droppings before initiation of a BDM program and compare that number to those exposed at the same site during or after a BDM program. This would allow comparison of the number of potential disease exposures between the two time periods. In either scenario, a score of "adequate" or "inadequate" (1 or 0, respectively) would be obtained and could be used as part of the evaluation to determine whether or not objectives were met for the program.

3.4 DETERMINATION OF OVERALL OBJECTIVE GRADE

Success in meeting objectives for the Statewide BDM program will be determined using any combination which incorporates both qualitative and quantitative data, but the choice of components may depend on the availability and appropriateness of data. Thus a WS program manager may use Cooperator assessments, combined with observed / calculated damage reductions, or Cooperator assessments combined with observed / calculated resources saved to formulate a conclusion of record for the BDM program. Likewise, the WS program manager may use Cooperator assessments and a combination of observed / calculated damage reductions and observed / calculated resources saved to formulate a conclusion of record. This latter method is depicted in Table 3-1. A typical record would always contain Cooperator input grades, and could contain both damage reduction and resources saved grades, or only one of the two. Each separate record would have at least two grades.

Conclusions about accomplishments related to objectives in a statewide BDM program will be derived using both cooperator input (qualitative information)and WS calculated data (quantitative information), as available and appropriate, in the following way:

- A numeric rating will be obtained for each project by averaging together the qualitative and quantitative ratings that are derived from evaluating each specific program.

- A majority (51% or greater) grade of "Adequate" based on pooled grades from all BDM projects in Tennessee during the selected time frame will satisfy a conclusion that the program successfully met objectives set forth.

- WS BDM program managers will calculate and record a conclusion concerning program objectives on an annual basis for the overall statewide BDM program. This record will be derived by calculating a grade for each cooperative program upon its completion to derive individual values to be pooled for final statewide conclusions about accomplishment of objectives.

A prototypical summary of individual projects with project grades, final totals and calculation of the annual BDM grade is presented in Table 3-1. This prototypical program depicts the completion and scoring of 10 BDM programs during the year and indicates that eight of ten programs received an "adequate(rating of 1)" from Cooperators and eight programs received an "adequate" rating as determined by WS calculations. Following the formula in the table, a final grade of 80% is derived. Since a grade of 51% was needed, the imaginary BDM program was successful in meeting objectives.

Table 3-1. Summary Of Prototypical Cooperative BDM Programs With Derived Grades And Calculated Score From Pooled Results For The Purpose Of Determining Success In Meeting Overall BDM Program Objectives.

COOPERATIVE PROGRAMS	A COOPERATOR GRADE (0 or 1)	B DAMAGE REDUCTION GRADE (0 or 1)	C RESOURCES SAVED GRADE (0 or 1)
1. Agricultural Protection Program # 1	1	1	
2. Agricultural Protection Program # 2	0	1	
3. Human Health And Safety Protection Program # 1	1		1
4. Human Health And Safety Protection Program # 2	1	1	
5. Human Health And Safety Protection Program # 3	1	1	
6. Natural Resources Protection Program # 1	0		1
7. Natural Resources Protection Program # 2	1		0
8. Property Protection Program # 1	1	0	
9. Property Protection Program # 2	1		1
10. Property Protection Program # 3	1	1	
NUMERICAL TOTALS	8	5	3
FINAL SCORE IN PERCENT $\frac{1/2A + 1/2(B+C)}{\text{\# Programs}} X\ 100 = \frac{4 + 4}{10} X\ 100 = 80\%$			

4.0 CHAPTER 4: ALTERNATIVES INCLUDING THE PROPOSED ACTION

Alternatives analyzed in detail are:

1) Alternative 1 - Continue the Current Federal BDM Program. This is the Proposed Action as described in Chapter 1 and is the "No Action" alternative as defined by the Council on Environmental Quality for analysis of ongoing programs or activities.

2) Alternative 2 - Nonlethal BDM Only By WS

3) Alternative 3 - Technical Assistance Only. Under this alternative, WS would not conduct any direct operational BDM activities in Tennessee. If requested, affected requesters would be provided with technical assistance information only.

4) Alternative 4 - No Federal WS BDM. This alternative consists of no Federal BDM program by WS.

4.1 DESCRIPTION OF THE ALTERNATIVES

4.1.1 Alternative 1 - Continue the Current Federal BDM Program (No Action/Proposed Action)

The No Action alternative is a procedural NEPA requirement (40 CFR 1502), is a viable and reasonable alternative that could be selected, and serves as a baseline for comparison with the other alternatives. The No Action alternative, as defined here, is consistent with the Council on Environmental Quality's (CEQ's) definition (CEQ 1981).

The proposed action is to continue the current portion of the WS program in Tennessee that responds to requests for BDM to protect human health and safety, agricultural crops, turf, livestock feed, livestock, livestock health, property, structures, utilities, threatened and endangered species, other wildlife, other natural resources, and aquaculture in the State of Tennessee. A major component of the current program consists of an Integrated Wildlife Damage Management (IWDM) approach to address human health and safety threats and property damage associated with large concentrations of birds at roosts and other sites at both public and private facilities in the State. 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 European starlings and blackbirds at requesting dairies and feedlots, and to meet requests to minimize damage or the risk of damage to agriculture, other wildlife species, or other resources caused by birds. To meet these goals WS would have the objective of responding to all requests for assistance with, at a minimum, technical assistance or self-help advice, or, where appropriate and when cooperative or congressional funding is available, direct damage management assistance in which professional WS Specialists or WS Wildlife Biologists conduct damage management actions. An IWDM approach would continue to be implemented which would allow use of any legal technique or method, used singly or in combination, to meet requester needs for resolving conflicts with birds. Agricultural producers and others requesting assistance would be provided with information regarding the use of effective nonlethal and lethal techniques. Lethal methods used by WS would include shooting, trapping, nest and/or egg destruction, DRC-1339 (Starlicide), Avitrol, or euthanasia following live capture by trapping, hand capture, nets, or use of the tranquilizer alpha-chloralose (A-C). Nonlethal methods used by WS may include pruning or thinning of trees, porcupine wire deterrents, wire barriers and deterrents, the tranquilizer A-C, live-capture by cages, nets, net guns, hand nets, drop nets, rocket nets, followed by translocation of captured birds,

chemical repellents (e.g., methyl and di-methyl anthranilate, or anthraquinone), and harassment. In many situations, the implementation of nonlethal methods such as exclusion-type barriers would be the responsibility of the requester which means that, in those situations, WS's only function would be to implement lethal methods if determined to be necessary. BDM by WS would be allowed in the State, when requested, on private property 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. Appendix B provides a more detailed description of the methods that could be used under the proposed action.

4.1.2 Alternative 2 - Nonlethal BDM Only By WS

This alternative would require WS to use nonlethal methods only to resolve bird damage problems. Persons receiving technical assistance could still resort to lethal methods that were available to them. Currently, DRC-1339 and alpha-chloralose are only available for use by WS employees. Therefore, use of these chemicals by private individuals is and would be illegal. Appendix B describes a number of nonlethal methods available for use by WS under this alternative.

4.1.3 Alternative 3 - Technical Assistance Only

This alternative would not allow for WS operational BDM in Tennessee. WS would only provide technical assistance and make recommendations when requested. Producers, property owners, 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 alpha-chloralose are only available for use by WS employees. WS would neither provide these chemicals nor supervise the use of these chemicals under this alternative. Therefore, use of these chemicals by private individuals is and would be illegal. Appendix B describes a number of methods that could be employed by private individuals or other agencies after receiving technical assistance advice under this alternative.

4.1.4 Alternative 4 - No Federal WS BDM

This alternative would eliminate Federal involvement in BDM in Tennessee. WS would not provide direct operational or technical assistance and requesters of WS services would have to conduct their own BDM without WS input. Information on BDM methods would still be available to producers and property owners through such sources as USDA Agricultural Extension Service offices, TWRA, universities, or pest control organizations. DRC-1339 and alpha-chloralose are only available for use by WS employees. Therefore, use of these chemicals by private individuals is and would be illegal. Avitrol could be used by State certified restricted-use pesticide applicators.

4.2 BDM STRATEGIES AND METHODOLOGIES AVAILABLE TO WS IN TENNESSEE

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 WS technical assistance and operational BDM by WS. Appendix B is a more thorough description of the methods that could be used or recommended by WS.

4.2.1 Integrated Wildlife Damage Management (IWDM)

The most effective approach to resolving wildlife damage is to integrate the use of several methods simultaneously or sequentially. The philosophy behind IWDM is to implement the best combination of effective management methods in a cost-effective[2] manner while minimizing the potentially harmful effects on humans, target and nontarget species, and the environment. IWDM may incorporate cultural practices (e.g., animal husbandry), habitat modification (e.g., exclusion), animal behavior modification (e.g., scaring), removal of individual offending animals, local population reduction, or any combination of these, depending on the circumstances of the specific damage problem.

4.2.2 The IWDM Strategies That WS Employs

4.2.2.1 Technical Assistance Recommendations

"Technical assistance" as used herein is information, demonstrations, and advice on available and appropriate wildlife damage management methods. The implementation of damage management actions is the responsibility of the requester. In some cases, WS provides supplies or materials that are of limited availability for non-WS entities to use. Technical assistance may be provided through a personal or telephone consultation, or during an on-site visit with the requester. Generally, several management strategies are described to the requester 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.

4.2.2.2 Direct Damage Management Assistance

This is the conduct or supervision of damage management activities by WS 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 direct damage management by WS. The initial investigation defines the nature, history, extent of the problem, species responsible for the damage, and methods that would be available to resolve the problem. Professional skills of WS personnel are often required to effectively resolve problems, especially if restricted use pesticides are necessary, or if the problems are complex.

4.2.2.3 Examples of WS Direct Operational and Technical Assistance in BDM in Tennessee.

The following examples serve as illustrations of WS Direct Operational and Technical Assistance BDM projects. They are intended to present realistic examples of on-going BDM projects only and are not a conclusive or all encompassing list of all BDM projects conducted by WS in Tennessee.

Management of Wildlife Hazards to Aircraft and Air Passengers in Tennessee

2 The cost of management may sometimes be secondary because of overriding environmental, legal, human health and safety, animal welfare, or other concerns.

WS participates with the Federal Aviation Administration under a MOU to provide information or services, upon request, to airports in Tennessee. Sometimes WS evaluates wildlife hazards at airports upon request, provides such airports with Wildlife Hazard Assessments which outline wildlife hazards found, and assists airports in developing Wildlife Hazard Management Plans to address wildlife threats. WS also sometimes assists airports in obtaining USFWS depredation permits for the purpose of managing hazard threats posed by migratory birds. IWDM strategies are employed and recommended for these facilities.

WS's current program in Tennessee utilizes one full-time and several part-time employees to conduct IWDM programs and to monitor wildlife hazards at airports to insure the protection of human lives and aircraft. In addition to direct operational activities consisting of various harassment, live capture with translocation, and lethal removal techniques aimed at potentially injurious wildlife, WS personnel provide ongoing technical advice to airport managers about how to reduce the presence of wildlife in airport environs. WS may also oversee various habitat management projects implemented by airport personnel in order to provide technical expertise about methods. In addition, WS promotes improved bird strike record keeping and maintains a program of bird identification and monitoring of bird numbers at participating airports.

WS may receive requests in the future from airports previously discussed, or any other airports in Tennessee, for assistance in resolving wildlife hazards to aviation. WS may provide technical assistance and / or direct operational assistance using any combination of approved methods discussed in this EA which are appropriate for use in airport environments.

Management of Damage Caused by Feral Domestic Pigeons

Feral domestic pigeons are responsible for a large majority of nuisance bird damage and human health and safety requests for assistance in Tennessee. The most common situation with this species involves pigeons roosting and nesting on buildings and structures. The main problem is from the birds' droppings which cause concerns for diseases associated with bird droppings, an unsightly mess, and result in clean-up costs. These problems are frequently addressed by recommending exclusion devices/barriers (such as netting, hardware cloth, screen, porcupine wire) or habitat modification and local population reduction. Methods that could be used for population reduction include shooting with pellet rifles, low-velocity .22 caliber rifle rounds (that shoot bullets at about the same velocity as a pellet rifle), shotguns (mostly in rural or semi-rural situations), live capture with cage traps followed by euthanasia, DRC-1339 baiting, or Avitrol.

WS has been requested in the past to manage damage caused by feral domestic pigeons through direct operational projects. These projects have included activities to reduce local pigeon numbers in or at several cities and facilities around the State. WS expects to receive future requests from entities presently or previously assisted, as well as other entities across the State and could respond with technical assistance, direct operational assistance, or a combination of both in any situation in the State.

Management of Damage Caused by Urban Waterfowl

Canada geese and mallard ducks (*Anas platyrhynchos*) have populations in most major cities in Tennessee. These species concentrate in areas where water is available such as swimming pools, various sized ponds and small lakes at business parks, golf courses, city, county and state parks, lakes

owned and operated by homeowner associations in large subdivisions, and city water source reservoirs. Mating birds usually are implicated in the greatest damage losses, because they spend longer periods at a damage site than itinerant and migratory birds, and parents and their young may use the same site late in the season and in recurrent years. WS responded to 509 calls for assistance with damage caused by waterfowl during FY 1999-2001. Assistance was provided for threats to human health and safety, property damage, and nuisance problems associated with waterfowl. Many of these calls are handled through technical assistance provided as advisory leaflets, or more specific recommendations resulting from visits by WS to damage sites. Normally, complainants are advised to use strategies which combine harassment with environmental manipulation such as netting, grid wire exclusion systems and changing the vegetation to deter nesting. In some situations, elimination of water bodies is recommended. If non-lethal strategies are unsuccessful, WS may sometimes recommend a USFWS depredation permit be granted to the requester for nest and egg destruction or egg addling. A major component of waterfowl damage management in Tennessee includes a live-capture and translocation program provided by WS for a fee to those requesting direct assistance. In these programs WS may use corral-capture, net guns, rocket nets, hand nets, hand capture, cage traps, drop nets, or alpha-chloralose to live capture birds which are then translocated to alternative sites and released. In instances where human health and safety threats cannot be resolved through non-lethal methods, selective lethal removal of a few waterfowl could be performed. This method may also be used to reinforce harassment programs where human health and safety or agricultural losses are a factor and would usually result in the selective removal of a few birds.

WS expects to continue to receive numerous requests for assistance in managing damage caused by urban waterfowl from Federal, State or Local government agencies, businesses, or private individuals in Tennessee in the future. WS may provide technical or direct operational assistance to requesters in an effort to resolve damage problems caused by waterfowl. IWDM strategies will be recommended by WS, and direct operational assistance could include any of the methods previously discussed.

Management of Damage Caused by Vultures

Both turkey and black vultures inhabit Tennessee and are present most of the year. Vultures usually congregate into roosting and loafing flocks in areas of Tennessee that have tracts of woodland, primarily mature oak and hickory stands. Many such sites are located near recreational areas, residential housing developments, and urban/suburban areas. These birds damage roofs and weather stripping on houses and if congregating near lake sites where boats and marinas are located will destroy canopies, roofs, seats, and trim on these recreational craft. In addition, WS receives numerous calls from cattle producers who request assistance with vultures which are preying on newborn calves and/or cows in the process of calving. Other problems associated with large vulture flocks in Tennessee include power disruption and damage to equipment at power generating facilities and defacing of historic sites such as cemeteries. Requesters seeking help reported more than $202,775 in vulture related damages during FY 1999-2001. In addition, many people expressed concerns for sanitation and possible disease threats from dropping deposits left by vulture flocks, for which no dollar value could be attached.

During FY 1999-2001, WS responded to 225 requests for assistance with problem vulture flocks. Most of the requests were handled through technical assistance. In some instances where individuals suffering damage used non-lethal techniques such as noise harassment to scare the birds away without success, WS made recommendations to USFWS that depredation permits be provided to those who applied. The permits would allow property owners to lethally remove 10% or less of the offending

birds to reinforce other harassment efforts. In some instances, property owners asked for direct operational assistance.

WS may be requested to provide assistance to property owners or managers, livestock producers, or local health officials to address problems caused by vultures. This assistance may be provided under any conditions previously mentioned or under similar conditions where agriculture, natural resources, other wildlife, property, or human health and safety are at risk. IWDM strategies would be used or recommended by WS to address problems associated with vulture flocks in Tennessee.

4.2.3 WS Decision Making

WS personnel use a thought process for evaluating and responding to damage complaints that are depicted by the WS Decision Model described by Slate et al., in 1992 (Figure 4-1). WS personnel are frequently contacted after requesters have tried or considered nonlethal methods and found them to be impractical, too costly, or inadequate for acceptably reducing damage. WS 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, methods deemed to be practical for the situation are incorporated into a management strategy. After this strategy has been implemented, monitoring is conducted and evaluation continues to assess the effectiveness of the strategy. If the strategy is effective, the need for further management is ended. In terms of the WS Decision Model (Slate et al. 1992), 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 documenting process, but a mental problem-solving process common to most if not all professions.

4.2.4 Bird Damage Management Methods Available for Use. (See Appendix B)

4.2.4.1 Nonchemical, Nonlethal Methods (See Appendix B for detailed descriptions)

Agricultural producer and property owner practices consist primarily of nonlethal preventive methods such as **cultural methods[3] and habitat modification.**
Animal behavior modification refers to tactics that alter the behavior of birds to reduce damages. Some but not all of these tactics include the following:

- Exclusions such as netting
- Propane exploders (to scare birds)
- Pyrotechnics (to scare birds)
- Distress calls and sound producing devices (to scare birds)
- Visual repellents and scaring tactics

[3] Generally involves modifications to the management of protected resources to reduce their vulnerability to wildlife damage..

Relocation or **dispersal** of damaging birds to other areas

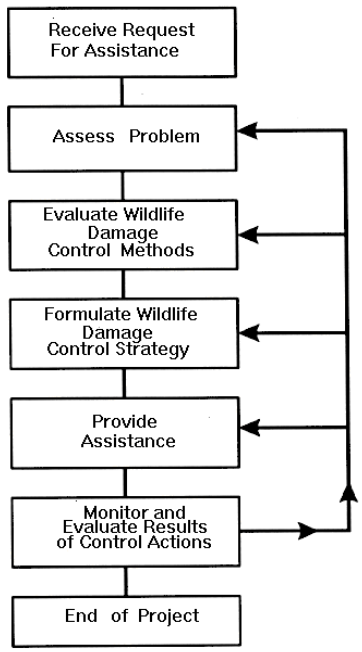
Nest destruction of the target species before eggs or young are in the nest

Habitat/environmental modification to attract or repel certain bird species

Live traps are various types of traps designed to capture birds alive for relocation or euthanasia. Some examples are clover traps, decoy traps, nest box traps, mist nets, corrals, etc.

Lure crops/alternate foods are crops planted or other food resources provided to mitigate the potential loss of higher value crops.

Figure 4-1. APHIS, WS Decision Model



4.2.4.2 Chemical, Nonlethal Methods (See Appendix B for detailed descriptions and Appendix E for EPA labels and MSDS)

Avitrol is a chemical frightening agent registered for use on pigeons, crows, gulls, blackbirds, European starlings, and English sparrows in various situations. This chemical works by causing distress behavior in the birds that consume treated baits from a mixture of treated and untreated bait, which generally frightens the other birds from the site. Generally birds that eat the treated bait will die (Johnson and Glahn 1994).

Alpha-chloralose is used as an immobilizing agent, which is a central nervous system depressant, and used to capture waterfowl or other birds. It is generally used in recreational and residential areas, such as swimming pools, shoreline residential areas, golf courses, or resorts. Alpha-chloralose is typically delivered as a well-contained bait in small quantities with minimal hazards to pets and humans; single baits consisting of bread or corn are fed directly to the target birds.

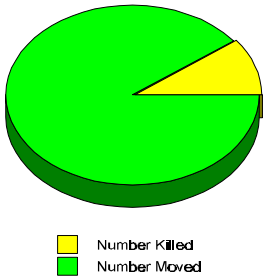
Methyl Anthranilate (MA) and **Di-methyl Anthranilate** (artificial grape flavoring food additive) has been shown to be an effective repellent for many bird species, including waterfowl. It can be applied to turf or surface water or as a fog to repel birds from small areas. It may also become available for use as a livestock feed additive that has bird repellent value.

Other repellents: Other bird repellents that might become available include anthraquinone (Avery et al. 1997) and charcoal particles (e.g., adhered to livestock feed).

4.2.4.3 Mechanical, Lethal Methods (See Appendix B for detailed descriptions)

Egg addling/oiling/destruction is the practice of destroying the embryo in the egg prior to hatching; physically breaking eggs; or directly removing eggs from a nest and destroying them.

Figure 4-2. Numbers of Blackbirds and European Starlings Killed vs.The Number Moved or Dispersed Via Nonlethal Means by WS FY 1999-2001.



Decoy and nest box traps are sometimes used by WS to capture blackbirds and European starlings. Decoy traps are set in limited numbers in selected locations where a resident population is causing localized damage or where other techniques cannot be used. Decoy traps are similar in design to the Australian Crow Trap as reported by Johnson and Glahn (1994) and McCracken (1972). Live decoy birds are placed in the trap with sufficient food and water to assure their survival. Feeding behavior and calls of the decoys attract other birds into the trap. Blackbirds and European starlings taken in these traps are euthanized.

Shooting is more effective as a dispersal technique than as a way to reduce European starling or blackbird numbers. Usually only a few dozen birds can be shot from individual flocks that can number anywhere from a few hundred to many thousands or hundreds of thousands before the rest of the birds become gun shy. Shooting, however, can be helpful in some situations to supplement and reinforce other dispersal techniques. It is selective for target species and may be used in conjunction with the use of spotlights, decoys, and calling. Shooting with rifles, shotguns, or pellet guns (rifles or pistols) is sometimes used to manage bird damage problems when lethal methods are determined to be appropriate. The birds are killed as quickly and humanely as possible.

Sport hunting can be part of a BDM strategy to enhance the effectiveness of harassment techniques. For example, WS sometimes directs sport hunters to contact TWRA about areas where Canada geese causing damage may be hunted.

Snap traps are modified rat traps that are used to remove individual birds such as woodpeckers causing damage to buildings.

4.2.4.4 Chemical, Lethal Methods (See Appendix B for detailed descriptions)

DRC-1339 is a slow acting avicide for reducing damage from several species of birds, including blackbirds, European starlings, pigeons, crows, ravens, magpies, and gulls. DRC-1339 is highly toxic to sensitive species but only slightly toxic to nonsensitive birds, predatory birds and mammals. This chemical would be the primary lethal chemical method used for feral domestic pigeon, starling, and blackbird damage management under the current program.

Carbon dioxide (CO_2) gas is an American Veterinary Medical Association (AVMA) approved euthanasia method which is sometimes used to euthanize birds which are captured in live traps or by chemical immobilization and when relocation is not a feasible option (Beaver et al. 2001). Live birds are placed in a container or chamber into which CO_2 gas is released. The birds quickly expire after inhaling the gas.

4.2.4.5 Mechanical, Lethal Methods (See Appendix B for detailed descriptions)

4.2.5 ALTERNATIVE 2 - Nonlethal BDM Only By WS

This alternative would require that WS only utilize nonlethal methods in addressing bird damage problems. Historically, in Tennessee, WS's activities in resolving blackbird and starling damage have been approximately 90% nonlethal (Fig. 4-2). For example, for the 3-year period of FY 1999- 2001, the number of blackbirds and European starlings killed by WS personnel in Tennessee was 6,031, while the number dispersed through various harassment projects totaled an estimated 51,937 (Figure 4-2). For other types of BDM problems, producers, State agency personnel, or others could conduct BDM activities including the use of traps**,** shooting, and any lethal or nonlethal methods they deem effective. However, DRC-1339 and alpha-chloralose 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 other alternatives such as Avitrol if chemical control was needed.

4.2.6 ALTERNATIVE 3 - Technical Assistance Only

This alternative would not allow WS operational BDM in the State. WS would only provide technical assistance and make recommendations when requested. Producers, State agency personnel, or others could conduct BDM activities including the use of traps**,** shooting, and any lethal or nonlethal methods they deem effective. However, DRC-1339 and alpha-chloralose 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 other alternatives such as Avitrol if chemical control was needed.

4.2.7 ALTERNATIVE 4 - No Federal WS Bird Damage Management

This alternative would consist of no Federal involvement in BDM. in the State -- neither direct operational damage management assistance nor informational/advisory technical assistance would be employed by WS. Information on future developments in nonlethal and lethal management techniques that culminate from research efforts by WS's research branch would still be available to affected resource owners or managers. However, the Tennessee WS program 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 traps**,** shooting, and any lethal or nonlethal methods they deem effective with the exception of DRC-1339 and Alpha-chloralose which 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 other alternatives such as Avitrol if chemical control was needed.

4.3 ALTERNATIVES CONSIDERED BUT NOT ANALYZED IN DETAIL WITH RATIONALE

Several alternatives were considered, but not analyzed in detail. These were:

4.3.1 Lethal BDM Only By WS

Under this alternative, WS 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 some bird damage problems can be resolved effectively through nonlethal means. For example, a number of damage problems involving the encroachment of injurious birds into buildings can be resolved by installing barriers or repairing of structural damage to the buildings, thus excluding the birds. Further, such damage situations as immediately clearing a runway of a large flock of

injurious birds could not be implemented immediately, while scaring them away through noise harassment might resolve the air passengers' threat at once. In addition, a lethal-only program does not satisfy wildlife management objectives of WS, TWRA, and USFWS.

4.3.2 Compensation for Bird Damage Losses

The Compensation alternative would require the establishment of a system to reimburse persons impacted by bird damage. This alternative was eliminated from further analysis because no Federal or State laws currently exist to authorize such action. Under such an alternative, WS would not provide any direct control or technical assistance. Aside from lack of legal authority, analysis of this alternative in the FEIS indicated that the concept has many drawbacks (USDA 1997):

- It would require larger expenditures of money and labor to investigate and validate all damage claims, and to determine and administer appropriate compensation. A compensation program would likely cost several times as much as the current program. In Tennessee, damage reported to WS by all species of damaging animals exceeded $2 million during FY 1999 - 2001, yet the current WS program of abating such damage only costs about $162,000 federally appropriated funds per year. In addition, damage reported as $2 million for Tennessee was actually far less than occurred in reality, since only $4,400 in costs related to human health and safety were derived, because of the difficulty of determining such damage values.
- Compensation would most likely be below full market value. It is difficult to make timely responses to all requests to assess and confirm damage, and certain types of damage could not be conclusively verified. For example, it would be impossible to prove conclusively in individual situations that birds were responsible for disease outbreaks even though they may actually have been responsible. Thus, a compensation program that requires verification would not meet its objective for mitigating such losses.
- Compensation would give little incentive to resource owners to limit damage through improved cultural, husbandry, or other practices and management strategies.
- Not all resource owners would rely completely on a compensation program and unregulated lethal control would most likely continue as permitted by State law.
- Compensation would not be practical for reducing threats to human health and safety.

4.3.3 Short Term Eradication and Long Term Population Suppression

An eradication alternative would direct all WS program efforts toward total long term elimination of bird populations on private, State, Local and Federal government lands wherever a cooperative program was initiated in the State.

In Tennessee, eradication of native bird species (the starling, English sparrow, and feral domestic pigeon are not native to North America) is not a desired population management goal of State agencies or WS. Although generally difficult to achieve, eradication of a local population of feral domestic pigeons or European starlings may be the goal of individual BDM projects in fulfillment of Executive Order 13112 On Invasive Species (see Subsection 1.7.2.7). This is because feral domestic pigeons and European starlings are not native to North America and are only present because of human introduction. However, eradication as a general strategy for managing bird damage will not be considered in detail because:

- All State and Federal agencies with interest in, or jurisdiction over, wildlife oppose eradication of any native wildlife species.

- Eradication is not acceptable to most people.

- Because blackbirds and European starlings are migratory and most winter populations in Tennessee may be comprised in part of winter migrants from northern latitudes, eradication would have to be targeted at the entire North American populations of these species to be successful. That would not be feasible or desirable.

Suppression would direct WS program efforts toward managed reduction of certain problem populations or groups. In areas where damage can be attributed to localized populations of birds, WS can decide to implement local population suppression as a result of using the WS Decision Model. Problems with the concept of suppression are similar to those described above for eradication.

It is not realistic or practical to consider large-scale population suppression as the basis of the WS program. Typically, WS activities in the State would be conducted on a very small portion of the sites or areas inhabited or frequented by problem species.

4.4 MITIGATION AND STANDARD OPERATING PROCEDURES FOR BIRD DAMAGE MANAGEMENT TECHNIQUES

4.4.1 Mitigation in Standard Operating Procedures (SOPs)

Mitigation measures are any features of an action that serve to prevent, reduce, or compensate for effects that otherwise might result from that action. The current WS program, nationwide and in Tennessee, uses many such mitigation measures and these are discussed in detail in Chapter 5 of the FEIS (USDA 1997). Some key mitigating measures pertinent to the proposed action and alternatives that are incorporated into WS's Standard Operating Procedures include:

- The WS Decision Model thought process which is used to identify effective wildlife damage management strategies and their effects.
- Reasonable and prudent measures or alternatives are identified through consultation with the USFWS and are implemented to avoid effects to T&E species.
- EPA-approved label directions are followed for all pesticide use. The registration process for chemical pesticides is intended to assure minimal adverse effects to the environment when chemicals are used in accordance with label directions.
- All WS Specialists in the State who use restricted chemicals are trained and certified by, or else operate under the direct supervision of, program personnel or others who are experts in the safe and effective use of chemical BDM materials.
- The presence of nontarget species is monitored before using DRC-1339 to control European starlings, blackbirds, and pigeons to reduce the risk of significant mortality of nontarget species populations.

- Research is being conducted to improve BDM methods and strategies so as to increase selectivity for target species, to develop effective nonlethal control methods, and to evaluate nontarget hazards and environmental effects.

Some additional mitigating factors specific to the current program include:

- Management actions would be directed toward localized populations or groups of target species and/or individual offending members of those species. Generalized population suppression across the State, or even across major portions of the State, would not be conducted.
- WS uses BDM devices and conducts activities for which the risk of hazards to public safety and hazard to the environment have been determined to be low according to a formal risk assessment (USDA 1997, Appendix P). Where such activities are conducted on private lands or other lands of restricted public access, the risk of hazards to the public is even further reduced.

4.4.2 Additional Mitigation Specific to the Issues

The following is a summary of additional mitigation measures that are specific to the issues listed in Chapter 2 of this document.

4.4.2.1 Effects on Target Species Populations

- BDM activities are directed to resolving bird damage problems by taking action against individual problem birds, or local populations or groups, not by attempting to eradicate populations in the entire area or region.
- WS take is monitored by comparing numbers of birds killed by species or species group (e.g., blackbirds) with overall populations or trends in populations to assure the magnitude of take is maintained below the level that would cause significant adverse effects to the viability of native species populations (See Chapter 5).

4.4.2.2 Effects on Nontarget Species Populations Including T&E Species

WS personnel are trained and experienced to select the most appropriate method for taking problem animals and excluding nontargets.

- Observations of birds feeding at feedlots, dairies, or blackbird/European starling staging areas, or of birds that are associated with feral domestic pigeon concentrations are made to determine if nontarget or T & E species would be at risk from BDM activities.

- WS has consulted with the USFWS regarding potential effects of control methods on T&E species, and abides by reasonable and prudent alternatives (RPAs) and/or reasonable and prudent measures (RPMs) established as a result of that consultation. For the full context of the Biological Opinion see the ADC FEIS, Appendix F (USDA 1997). Further consultation on species not covered by or included in that formal consultation process will be initiated with the USFWS and

WS will abide by any RPAs, RPMs, and terms and conditions that result from that process to avoid jeopardizing any listed species.

- WS uses chemical methods for BDM that have undergone rigorous research to prove their safety and lack of serious effects on nontarget animals and the environment.

5.0 CHAPTER 5: ENVIRONMENTAL CONSEQUENCES

Chapter Five provides information needed for making informed decisions in selecting the appropriate alternative for meeting the purpose of the proposed action. The chapter analyzes the environmental consequences of each alternative 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 No Action Alternative to determine if the real or potential effects 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 effects 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.

The following resource values within the State are not expected to be significantly impacted by any of the alternatives analyzed: soils, geology, minerals, water quality/quantity, floodplains, wetlands, visual resources, air quality, prime and unique farmlands, aquatic resources, timber, and range. These resources will not be analyzed further.

Cumulative Effects: Discussed in relationship to each of the alternatives analyzed, with emphasis on potential cumulative effects from methods employed, and including summary analyses of potential cumulative impacts to target and nontarget species, including T & E species.

Irreversible and Irretrievable Commitments of Resources: Other than minor uses of fuels for motor vehicles and other materials, there are no irreversible or irretrievable commitments of resources.

Effects on sites or resources protected under the National Historic Preservation Act: WS BDM actions are not undertakings that could adversely affect historic resources (See Section 1.7.2.5).

5.1 ENVIRONMENTAL CONSEQUENCES FOR ISSUES ANALYZED IN DETAIL

5.1.1 Effects on Target Species Bird Populations

5.1.1.1 Alternative 1. - Continue the Current Federal Bird Damage Management Program (The Proposed Action/No Action as Described in Chapter 1)

Analysis of this issue is limited primarily to those species most often killed during WS BDM. The analysis for magnitude of impact generally follows the process described in Chapter 4 of USDA (1997). 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, WS only conducts damage management on species whose population densities are high and usually only after they have caused damage. Table 5-1 shows the numbers of birds killed by species and method as a result of WS BDM activities in Tennessee from FY 1999 through FY 2001.

European Starling and Blackbird Population Effects

Colonization of North America by the European Starling began on March 6, 1890 when 80 European starlings were released into New York's Central Park by a Mr. Eugene Scheifflin, a member of the Acclimatization Society. The birds thrived and exploited their new habitat. By 1918, the advance

Table 5-1. Birds Killed By WS Through All Methods, And Eggs Destroyed in Tennessee Bird Damage Management Programs during FY 1999 - 2001.
*Birds killed were due to inadvertent alpha-chloralose mortality or subsequent euthanasia following capture.

SPECIES	DAMAGE MANAGEMENT METHOD										
	*Alpha Chloralose	DRC - 1339	Avitrol	Raptor Trap	Cage Trap	Shooting	Mist Net	Hand Caught	Eggs/Nest Destroyed	Trap, Other	TOTAL
Blackbirds, Mixed						13					13
American Crow						6					6
Mourning Dove					32	1788		1			1821
Dabbling Duck	10					3		1			14
Feral Duck	20										20
House Finch						23					23
Canada Geese	23					7		1		7	38
Feral Geese	3					1				18	22
Grackle						33					33
Great Blue Heron						42		27		1	70
Hawk, other				1							1
Red Tailed Hawk				2		2			2		6
American Kestral						4					4
Killdeer						9					9
Mallard	15					9					24
Meadow-lark						4					4
Great Horned Owl				3							3
Feral Pigeon		1097			2619	2092		8	11		5827
American Robin						1		1	4		6

SPECIES	DAMAGE MANAGEMENT METHOD										
Shorebird, other						4					4
	*Alpha Chloralose	DRC - 1339	Avitrol	Raptor Trap	Cage Trap	Shooting	Mist Net	Hand Caught	Eggs/Nest Destroyed	Trap, Other	TOTAL
European Starling		5560			198	221	26		2		6007
H/E Sparrow			145		26				90		261
Barn Swallow								28			28
Turkey Vulture						37				5	42
Vultures, Mixed						173					173
Black Vulture					168	204				25	397
TOTAL TAKE BY METHOD AND SPECIES	**71**	**6657**	**145**	**6**	**3043**	**4676**	**26**	**67**	**109**	**56**	**14856**

line of migrant juveniles extended from Ohio to Alabama; by 1926 from Illinois to Texas; by 1941 from Idaho to Kentucky; and by 1946 to California and Canadian coasts (Miller 1975). In just 50 short years the starling had colonized the United States and expanded into Canada and Mexico and 80 years after the initial introduction had become one of the most common birds in North America (Feare 1984).

Precise counts of blackbird and starling populations do not exist but one estimate placed the United States summer population of the blackbird group at more than one billion (USDA 1997) and the winter population at 500 million (Royal 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 European starlings in winter roosts (Bookhout and White 1981). Meanley and Royal (1976) estimated 538 million blackbirds and European starlings in winter roosts across the country during the winter of 1974-75. Of this total 74%, or 259 million of these birds were in the east.

An extensive population survey by Dolbeer and Stehn published in 1979 showed that, in the southeastern U.S., the number of breeding European starlings increased between 1966 and 1976. Breeding Bird Survey (BBS) data from Sauer et al. 2001 indicate a slight decrease (-0.6) in the

European starling breeding population in the U.S., a slight decrease (-0.9)in the eastern BBS region, and an increase in Tennessee (0.8), from 1966 -2000. Red-winged blackbirds, brown-headed cowbirds, and common grackles showed a slight decrease in population nationwide, in the eastern BBS region and Tennessee for the same period. While exact reasons for population decline are unknown, current research conducted by Blackwell and Dolbeer (2001) suggests a possible correlation between red-winged blackbird population decline and changes in agricultural practices.

The nationwide starling population has been estimated at 140 million (Johnson and Glahn 1994). The winter starling population in the eastern U. S. was estimated by Meanley and Royall (1976) to be more than 87 million. The eastern U. S. population of the remaining blackbird group was estimated at 285.5 million.

All of the above information suggests that populations of European starlings and blackbirds have been relatively stable in recent years. For most species that show upward or downward trends, such trends have been relatively gradual. Additionally, blackbird populations are healthy enough, and the problems they cause are extensive enough, that the USFWS has established a standing depredation order for use by the public. 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.

During FY 1999 - 2001, Tennessee WS took 46 blackbirds (including common grackles and brown-headed cowbirds) at all project sites in the State in all damage situations. During the same period , WS killed 6,007 European starlings during all program activities in Tennessee. This is an annual average of 16 blackbirds and 2003 European starlings for the three-year period.

Natural mortality in blackbird populations is between 50% and 65% of the population each year, regardless of human-caused control operations (USDA 1997). As previously discussed regional annual populations of the blackbird group in the eastern U. S. are at least 372 million, of which an estimated 140 million are European starlings (Meanley and Royall 1976 and Johnson and Glahn 1994). Estimated natural mortality of the blackbird group should therefore total between 186 and 241.8 (average 213.9) million birds annually. Average annual kills of blackbirds and European starlings in Tennessee (2,018) have been far less than 0.001% of the estimated average natural mortality of these populations, and would be expected to be no more than 3% of total average mortality in any single year under the current program. The average annual number of blackbirds and European starlings killed in the Tennessee WS BDM program (2,018) amounts to less than 0.001% of the southeastern U.S. wintering population (350 million).

Dolbeer et al. (1995) showed that WS kills of 3.6% of the wintering population had no effect on breeding populations the following spring. Dolbeer et al. (1976) constructed a population model which indicated that a reduction of 14.8% of the wintering blackbird population would reduce the spring breeding population by 20% and that a 56.2% reduction in the wintering blackbird population would reduce spring breeding populations by only 33%. Given the density-dependent relationships in a blackbird population (i.e., decreased mortality and increased fecundity of surviving birds), a much higher number would likely have to be killed in order to impact the regional breeding population.

Cumulative effects would be mortality caused by the Tennessee WS program added to the other known human causes of mortality. Given that the maximum annual mortality (Table 5-1, FY 2001) of 2,975

blackbirds and European starlings caused by the Tennessee WS program has not accounted for more than 0.001% of the regional blackbird/European starling population of 372.5 million (Meanley and Royall 1976), and should not exceed 3% of the population in any future year, the proposed damage management projects implemented under this alternative would have no significant impact on overall breeding populations.

Because nonnative European starlings exhibit negative effects on, and competition with, native birds (Ehrlich et al., 1988), they are considered by many wildlife biologists and ornithologists to be an undesirable component of North American wild and native ecosystems. Any reduction in starling populations in North America, even to the extent of complete eradication, could be considered a beneficial impact to native bird species.

Feral Domestic Pigeon Population Effects

The feral domestic pigeon, also known as the rock dove, is an introduced nonnative species in North America. BBS data indicate the species has been stable across the United States from 1967 through 2000, rising slightly (0.2) in the Eastern BBS region, and decreasing slightly (-0.2%)in Tennessee (Sauer et al. 2001). The species is not protected by Federal or State law. Any BDM involving lethal control actions by WS for this species would be restricted to isolated, individual sites, or communities. In those cases where feral domestic pigeons are causing damage or are a nuisance, complete removal of the local population could be achieved. This would be considered to be a beneficial impact on the human environment since it would be requested by the affected property owner or administrator. Although regional population effects would be minor, even if large 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. In addition, local reductions or elimination of pigeon flocks would be considered a positive impact to those individuals who are offended by the presence of these birds, and whose enjoyment of native songbirds is diminished by their presence. However, major population reduction in some localities may be considered to have negative effects by some individuals who experience aesthetic enjoyment of pigeons.

Between FY 1999 and FY 2001, WS took an average of 1,943 pigeons per year statewide, primarily to reduce sanitation problems and human health and safety threats associated with accumulations of droppings in areas used by humans (Table 5.1). The number of pigeons lethally removed during future WS damage management activities in Tennessee is expected to remain fairly stable and consistent with the numbers taken in past years, however it is possible that WS could kill as many as 3000 pigeons each year in such programs. This relatively small number of pigeons taken at multiple sites undoubtedly had and will continue to have little effect on overall pigeon populations in Tennessee.

Waterfowl Population Effects

WS does not usually conduct operational killing of waterfowl, although a few Canada geese and ducks are killed each year at airports as part of wildlife hazard management programs for these facilities. Almost all geese taken under these conditions are resident birds. BDM by WS for these species at other sites has historically been almost entirely nonlethal, and, therefore, results in no direct impact on populations of these species. Sport hunters kill controlled numbers of these species under the close regulatory management of the USFWS and the TWRA. In Tennessee during FY 1999 - 2001, WS

took an average of 13 Canada geese and 13 wild ducks per year (Table 5.1). Most of these birds were taken in programs to protect human safety at airports. During the same time period, WS used non-lethal methods to either move or translocate an additional 13,015 nuisance wild waterfowl. The majority of these birds were Canada geese. WS could kill as many as 500 Canada geese and 300 ducks per year in damage management projects associated with human health and safety in the State in future programs. However, based on current populations and trends, reduction in numbers through such programs would not be expected to have any negative effects on populations of these species in the State, or regionally. BBS population trend data indicates that U. S. and eastern BBS regions saw an increase in both Canada goose and mallard populations. In fact, eastern population and Tennessee trends increased 21.0% and 12.6% respectively, as compared with a national increase of 12.5% for Canada geese. While mallard populations trends in Tennessee experienced an increase of 11.3% as compared with a national increase of 3.6% and an eastern BBS regional increase of 3.8%.

Harassment by WS employees may negatively affect geese or ducks in the short term, especially if weather is particularly cold, because the birds are expending energy that they would otherwise not have to. However, there are likely no long term significant negative effects due to harassment (John Taylor, USFWS, Pers. Comm. 1997). Birds are usually moved to State or Federal refuges or management areas where higher quality and a larger quantity of feed is available. Some birds may be temporarily negatively affected by the use of alpha chloralose if it is used in live-capture events. However, no significant negative effects are known to occur to individual birds or populations of waterfowl from the use of this stupefactant as a capture mechanism. Also, populations of Canada geese in Tennessee are increasing (E. Warr, TWRA, Pers. Comm., 2001). Increasing populations of both mallards and Canada geese in Tennessee and in the east supports a conclusion that the WS BDM activities have not resulted in any significant direct or indirect adverse effects on these species.

A likely benefit to these species is that the success of the overall program would probably increase the tolerance of agricultural producers and the urban public to the presence of ducks and geese in both rural and urban environments.

English Sparrow Population Effects

English sparrows, or house sparrows, were introduced to North America from England in 1850 and have spread throughout the continent (Fitzwater 1994). The species is not protected by Federal or State laws. Like European starlings and pigeons, because of their negative effects and competition with native bird species, English sparrows are considered by many wildlife biologists, ornithologists, and naturalists to be an undesirable component of North American native ecosystems. English sparrows are found in nearly every habitat except dense forest, alpine, and desert environments. They prefer human-altered habitats, and are abundant on farms and in cities and suburbs (Robbins et al. 1983).

BBS population trends from 1966-2000 indicate that English sparrows are decreasing throughout the U. S. as a whole by about 2.5% per year (Sauer et al. 2001). Bird counts in Tennessee during successive years from 1966-2000 indicate that English sparrow populations are somewhat higher in the State than the national average and though declines parallel national trends, Tennessee only saw a decline of 2.1% per year over the same period. Robbins (1973) suggested that declines in the population of this species must be largely attributed to changes in farming practices which resulted in cleaner operations. One aspect of changing farming practices which might have been a factor

would be the considerable decline in small farms and associated disappearance of a multitude of small feed lots, stables and barns, a primary source of food for these birds in the early part of the 20th century. Ehrlich et al. (1986) suggested that English sparrow population declines might be linked to the dramatic decrease during the 20th century in the presence of horses as transport animals. Grain rich horse droppings were apparently a major food source for this species.

Although precise population numbers for English sparrows were not available for Tennessee and the region, Breeding Bird Surveys and the Audubon Society's, Christmas bird count (Saur et. al. 1996) revealed that this species was relatively, very abundant. Based on relative abundance of English sparrows for this region, application of all non-lethal methods proposed for BDM in Tennessee would not be likely to have any significant impact on regional populations of this species. In the three-year period from FY 1999-2001, WS killed an average of 87 English sparrows per year (Table 5-1) which should be an exceedingly minor component of overall English sparrow populations and overall English sparrow mortality. Because they are considered extremely abundant and are not afforded protection by Federal or State law, depredation permits are not required before they can be killed by the public. The number of English sparrows lethally removed during future WS damage management activities in Tennessee is expected to remain fairly stable and consistent with the numbers taken in past years, however it is possible that WS could kill as many as 300 English sparrows each year in such programs.

Any BDM involving lethal control of English sparrows by WS would probably be restricted to individual sites. As stated previously, because English sparrows are not native to North America, any reduction in English sparrow populations, even to the extent of complete eradication, could be considered a beneficial impact on populations of native bird species. Therefore, any reduction in this species' populations in North America should not be considered as having any significant adverse impact on the quality of the human environment. Some individuals who watch or feed English sparrows, or those who might have established human-affectionate bonds with individual birds would be offended by reductions in populations or removal of individual birds.

Mourning Dove Population Effects

Mourning doves are migratory game birds with substantial populations throughout much of North America. Many States in the U. S. have regulated annual hunting seasons for the species and take is liberal. Tennessee allows a hunting season each year with generous bag limits of this species. The mourning dove sport harvest from 1997 - 1999 in Tennessee ranged from 2.1 - 3.4 million birds, with an annual average sport harvest of 2.6 million birds/season (TWRA, 2001). In contrast, Tennessee WS killed an average of 607 mourning doves per year during FY 1999-2001 (Table 5.1). Most of these birds were taken in programs to protect human safety at airports. BBS data indicates that mourning dove population trends were decreasing slightly (-0 .3%) in the U.S. and Tennessee (-0.8%), but rising (0.4%) in the Eastern BBS Region, from 1966-2000 (Saur et al., 2001). Mourning doves have become common inhabitants of urban environments in Tennessee, even nesting frequently in man-made structures (B. Hyle, E. Penrod, T. O'Connell, WS Pers. Comm, 2001). This species is the most abundant dove in North America, is the champion of multiple brooding in its range, and is expanding northward (Ehrlich et al, 1988). The number of mourning doves lethally removed during future WS damage management activities in Tennessee is expected to remain fairly stable and consistent with the numbers taken in past years, however it is possible that WS could kill as many as 800 mourning

doves each year in such programs. Based on population trends and hunter harvest data for this species in Tennessee, WS BDM activities will not have a significant impact on the species.

Vulture Population Effects

The turkey vulture is one of three species of vultures found in North America and is the most common and widespread of the New World vultures. This species nests throughout all of the United States except northern New England. They are conspicuous for their soaring behavior as they search for carcasses, locating them primarily by aid of the sense of smell. They possess weak feet and blunt claws instead of sharp talons like hawks and owls. Their heads are bare, which assists them in preventing their feathers from becoming fouled by carrion. They nest in tree cavities or on the ground. Turkey vultures are valuable for their removal of garbage and disease -causing carrion. At night they often gather in large roosts (National Audubon Society, 2000). BBS population trend data indicates that the turkey vulture has experienced an increasing population trend in the U. S. as a whole (1.3%), in the eastern BBS region (3.4%) and in Tennessee (3.8%) from 1966-2000 (Sauer et al., 2001).

Black vultures are scavengers that feed on carrion, but they also take weak, sick, or unprotected young birds and mammals. They are smaller but more aggressive than turkey vultures and will drive the latter from a carcass. Both species are often found perched in trees, on fence posts, and on the ground, or flying high overhead, especially on windy days, taking advantage of thermals or updrafts. Unlike turkey vultures, black vultures depend on their vision to find food. This species is more or less resident from Texas and Arkansas north and east to New Jersey and south to Florida, and are rarely found as far north and east as Massachusetts and Maine (National Audubon Society, 2000).

BBS data reveals an increasing population trend for black vultures in the U. S. (2.7%), the eastern BBS region (2.3%) and Tennessee (7.2%) from 1966 through 2000 (Sauer et al., 2001). This species appears to exhibit healthy and burgeoning populations in most of its range and has been reported to cause damage in several locations in the southeast [redacted] WS, K. Blanton WS, K. Stucker, WS, 2000, Pers. Comm.).

WS receives requests to address damage caused by both turkey and black vultures in Tennessee. Sometimes these two species are found causing damage at the same site and congregating in mixed flocks. During FY 1999-2001, 375 direct assistance activities were conducted by WS to address vulture damage in Tennessee. These activities included the use of visual, vehicle, and pyrotechnic harassment, and other noise harassment, and in some cases, harassment shooting of minimum numbers of birds at a project site to reinforce noise harassment. More than 13,183 vultures were addressed during that period of time in direct assistance projects conducted by WS. Less than 5% (612) of this number was actually killed (Table 5.1), and remaining birds were dispersed. Most of these birds were killed in association with harassment shooting to reinforce noise harassment as part of vulture dispersal activities. This small number of birds apparently had no significant impact on populations of the species in Tennessee or the region. Similar programs will likely be conducted in the future in the State. It is possible that WS could kill as many as 500 vultures each year in such programs. No significant negative effects are expected to occur as a result of such BDM programs.

Fish-eating Bird/ Colonial Nesting Waterbird Population Effects

Colonial nesting waterbirds in Tennessee include herons, egrets, and gulls. Specifically great blue herons (*Ardea herodius*), black-crowned night herons (*Nycticorax nycticorax*), yellow-crowned night herons (*Nycticorax violaceous*), herring gulls (*Larus argentatus*), ring-billed gulls (*Larus delawarensis*), cattle egrets (*Bubulcus ibis*), and great egrets (*Ardea alba*) . While nesting waterbirds are known to cause damage by predation to aquaculture facilities (Salmon and Conte, 1981, Schaeffer, 1992), in some situations in Tennessee, other localized problems are associated with these birds. They have also been implicated in damages to recreational fish collections, trees, structures, and landscaping in urban environments, (USDA-WS MIS Database). With the exception of black-crowned night herons and herring gulls, all named species are exhibiting increasing population trends throughout the eastern BBS from 1966 through 2000 (Sauer et al., 2001). BBS data reveals increasing population trends for great egrets (0.3%), cattle egrets (0.9), yellow-crowned night herons (2.6%), and ring-billed gulls (2.6%) (Sauer et al., 2001). In Tennessee, WS killed an average of 24 great blue herons per year during FY 1999-2001 (Table 5.1).

Great-blue herons and double-crested cormorants are the only fish-eating birds reported to WS in Tennessee as causing damage to fish production facilities. Great blue heron populations are increasing throughout their range as evidenced by BBS data. BBS data reveals increasing population trends in the U.S. (3.1), the eastern BBS region (3.6), and (15.8) in Tennessee from 1966 through 2000 (Sauer et al., 2001).Double-crested cormorant populations are at an all time high of more than an estimated 1-2 million birds, and these birds have been identified throughout much of the U. S. as causing excessive damage to aquaculture facilities by feeding on fish being produced (USDI 1998). BBS data reveals an increasing population trend for double-crested cormorants in the U. S. (7.6%), and the eastern BBS region (10.2%) from 1966 through 2000 (Sauer et al., 2001). USFWS has issued a standing depredation order authorizing that "in States where this species is shown to be seriously injurious to commercial freshwater aquaculture, and when found committing or about to commit depredations upon aquaculture stocks, persons engaged in the production of commercial freshwater aquaculture stocks may, without a Federal permit, take or cause to be taken such double -crested cormorants as might be necessary to protect aquaculture stocks" (USDI 1998).

WS may be requested to assist in managing damage caused by fish-eating birds in Tennessee. Normally, such BDM programs would employ noise harassment with harassment shooting with live shotgun rounds to reinforce other methods of dispersal. In such situations, 10-20% of offending birds may be killed to successfully protect the resources of a project site. Approximately 100-150 great blue herons could be killed annually by WS in such programs throughout Tennessee. In BDM projects involving double-crested cormorants, 400-500 birds of this species could be killed annually in all Tennessee programs. While the annual lethal take of other colonial waterbirds is expected to remain fairly consistent with past years, approximately 100 - 200 could be killed annually by WS in damage management programs throughout Tennessee. Based on present population trends, no significant negative effects are expected as a result of WS activities to manage damage being caused by colonial nesting waterbirds.

Other Target Species

Target species in addition to those analyzed above that have been killed in small numbers by WS during the past three fiscal years include eastern meadow larks (n=4), feral domestic ducks (n=20) , great horned owl (n=3), house finch (n=23), American Kestral (n=4), American robin (n=6), feral geese (n=22), killdeer (n=9), American crow (n=6), red-tailed hawk (n=6), and barn swallow (n=28) (Table 5-1). Other species that could be killed during BDM include any of the species listed in Section

1.2. The number of other bird species killed by WS during BDM activities is expected to remain relatively the same as in past years . None of these species are expected to be taken by WS BDM at any level that would significantly affect populations.

5.1.1.2 Alternative 2 - Nonlethal BDM Only by WS

Under this alternative, WS would not take any target species because no lethal methods would be used. This alternative would have the same impact on black-crowned night heron populations as the current program since WS's damage management for this species is already nonlethal only. Likewise, impacts to waterfowl would remain essentially unchanged, except for feral domestic ducks and geese which are sometimes euthanized. Some incidental take of waterfowl may occur as a result of the use of alpha-chloralose, as in the present program. Although WS take of target bird species such as English sparrows, feral domestic pigeons, blackbirds, and European starlings would not occur, it is likely that, without WS conducting some level of lethal BDM activities for these species, private BDM efforts would increase, leading to potentially similar or even greater effects on target species populations than those of the current program alternative. For the same reasons shown in the population effects analysis in section 4.1.1.1, however, it is unlikely that target bird populations would be impacted significantly by implementation of this alternative. Effects and hypothetical risks of illegal chemical toxicant use under this alternative would probably be greater than the proposed action, about the same as Alternative 3, but less than under Alternative 4.

5.1.1.3 Alternative 3 - Technical Assistance Only

Under this alternative, WS would have no direct impact on English sparrow, feral domestic pigeons, blackbird, European starling, or other target species populations in the State because the program would not conduct any operational BDM activities but would be limited to providing advice only. Private efforts to reduce or prevent bird damage and perceived disease transmission risks could increase which could result in similar or even greater effects on those populations than the current program alternative. For the same reasons shown in the population effects analysis in section 4.1.1.1, however, it is unlikely that target bird populations would be impacted significantly by implementation of this alternative. DRC-1339 and the tranquilizer alpha-chloralose are currently only available for use by WS employees. It is hypothetically possible that frustration caused by the inability to reduce damage and associated losses could lead to illegal use of other chemicals which could lead to real but unknown effects on target bird populations. Effects and hypothetical risks of illegal chemical toxicant use under this alternative would probably be about the same as those under Alternative 2.

5.1.1.4 Alternative 4 - No Federal WS BDM

Under this alternative, WS would have no impact on English sparrow, feral domestic pigeon, blackbird, starling, or other target species populations in the State. Private efforts to reduce or prevent depredations could increase which could result in effects on target species populations to an unknown degree. Effects 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 effects analysis in section 4.1.1.1 it is unlikely that target bird populations would be impacted significantly by implementation of this alternative. DRC-1339 and the tranquilizer alpha-chloralose are currently only available for use by WS employees. It is hypothetically possible that frustration caused by the inability to reduce damage and associated losses could lead to

illegal use of other chemicals which could lead to real but unknown effects on target bird populations.

5.1.2 Effects on Nontarget Species Populations, Including Threatened and Endangered Species

5.1.2.1 Alternative 1 - Continue the Current Federal Bird Damage Management Program (The Proposed Action / No Action)

Adverse Effects on Nontarget (non-T&E) Species. Direct impacts on nontarget species occur when WS program personnel inadvertently kill, injure, or harass animals that are not target species. In general, these impacts result from the use of methods that are not completely selective for target species. WS take of nontarget species during BDM activities has been extremely low. The only nontarget birds known to have been killed during BDM operations as described in the proposed action from FY 1999-2001 were two mourning doves and one great blue heron (Table 5-1). These data indicate that nontarget mortality has only been .0002% of the total number of birds killed over the past three years. Although it is possible that some nontarget birds were unknowingly killed by use of DRC-1339 for pigeon or blackbird/starling control, the method of application is designed to minimize or eliminate that risk. For example, DRC-1339 treated bait is only applied after a period of prebaiting with untreated bait material and when nontarget birds are not observed coming to feed at the site.

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. These occurrences are rare and should not affect the overall populations of any species under the current program.

Beneficial Effects on Nontarget Species. Interspecific nest competition has been well documented in European starlings. Miller (1975) and Barnes (1991) reported European starlings were responsible for a severe depletion of the eastern bluebird (*Sialis sialis*) population due to nest competition. Nest competition by European starlings has also been known to adversely impact American kestrels (sparrow hawks) (Von Jarchow 1943, Nickell 1967, and Wilmer 1987), red-bellied woodpeckers (*Centurus carolinus*), Gila woodpeckers (*Centurus uropygialis*)(Kerpez et.al. 1990 and Ingold 1994), and wood ducks (*Aix sponsa*) (Shake 1967, McGilvery et.al 1971, Heusmann et.al. 1977, and Grabill 1977). Weitzel (1988) reported nine native species of birds in Nevada had been displaced by starling nest competition, and Mason et al. (1972) reported European starlings evicting bats from nest holes. Control operations as proposed in this alternative could reduce starling populations, although probably not significantly. Reduction in nest site competition would be a beneficial impact on the species listed above. Although such reductions are not likely to be significant, the benefits would probably outweigh any adverse effects due to nontarget take.

T&E Species Effects. The USFWS lists the following 3 species of birds and 4 species of mammals as endangered in Tennessee: Bald eagle (*Haliaeetus leucocephalus*), Red cockaded woodpecker (*Picoides borealis*), Interior least tern (*Sterna antillarum athalassos*, Carolina Northern Flying Squirrel (*Glaucomys sabrinus coloratus*), Gray Bat (*Myotis grisescens*), Indiana Bat (*Myotis sodalis*),

Eastern Puma (*Puma concolor couguar*). The 1992 Biological Opinion from the USFWS determined that WS activities would not adversely affect the interior least tern, Carolina Northern flying squirrel, gray bat, Indiana bat, and the Eastern puma . The interior least tern was granted endangered status in 1985 and has been estimated at 4,700-5,000 adults. This species breeds along the major tributaries of the Mississippi River drainage basin from eastern Montana south to Texas and east to western Illinois, Missouri, Arkansas and Louisiana. Characteristic riverine nesting sites are dry, flat, sparsely vegetated sand-and gravel bars within a wide, unobstructed, water-filled river channel. They feed on small fish captured in the shallow water of rivers and lakes, choosing almost any fish species between one-half to three inches in length (Nebraska Game And Parks Commiss. 2000). The ADC FEIS concluded that control of least tern nest predators such as American crows, American kestrels, and great-horned owls (Nebraska Game And Parks Commiss. 2000) could have a positive effect on populations of this species. Because DRC-1339 and Avitrol are not applied in or near water and least terns feed in water and do not feed on grains or other bait materials used, no primary effects from chemical methods in the Tennessee WS BDM program are expected. No effects on this species from other actions of the BDM program conducted by WS in Tennessee are expected. No secondary effects on least terns, from any activity of the Tennessee BDM program, are expected.

The 1992 Biological Opinion from the USFWS determined that the only BDM method that might adversely affect the bald eagle was above ground use of strychnine treated bait for "nuisance birds." Strychnine is no longer registered for above ground use and would not be used by WS for BDM in the State. DRC-1339 poses no primary hazard to eagles because eagles do not eat grain or other bait materials on which this chemical might be applied during BDM, and, further, because eagles are highly resistant to DRC-1339 — up to 100 mg doses were force fed to captive golden eagles with no mortality or adverse effects noted other than regurgitation and head-shaking (Larsen and Dietrich 1970). Secondary hazards to raptors from DRC-1339 and Avitrol are low to nonexistent (see Appendix B). Therefore, WS BDM in Tennessee is not likely to have adverse effects on bald eagles.

The red-cockaded woodpecker was granted endangered status in 1970 (USFWS 2000). Tennessee lies in the extreme northern portion of its range. The 1992 Biological Opinion from the USFWS made no determination concerning any effect by WS BDM programs on the red-cockaded woodpecker and no effects from any component of a WS BDM program were identified in the programmatic ADC FEIS (USDA 1997). DRC-1339 nor Avitrol pose any primary hazard to red-cockaded woodpeckers because they do not eat grain or other bait materials on which this chemical might be applied during BDM programs. In addition, no secondary effects on red-cockaded woodpeckers are expected related to any actions in the Tennessee WS BDM program. There are no remaining red-cockaded woodpeckers presently in Tennessee (E. Warr, TWRA, Pers. Comm. 2001). Presently, there are no known red-cockaded woodpecker colonies in the state of Tennessee. There has not been a sighting since the last-known individual disappeared in December 1994 in Polk County. (Hammond and Sweeny 1997). This species uses mature pine and mixed pine and hardwood timber for habitat, feeding chiefly on insects. Because the species is no longer found in the state, no negative effects are expected to occur in Tennessee related to any BDM activity conducted by WS.

The 1992 Biological Opinion from the USFWS determined that no fish, clams, crustaceans, and plants would be adversely affected by any aspect of the WS program. Furthermore Mitigation measures to avoid T&E effects were described in Chapter 3 (Subsection 3.4.2.2) and are also described in Subsection 4.1.4.1 of this chapter. The inherent safety features of DRC-1339 use that preclude or minimize hazards to mammals and plants are described in Appendix B and in a formal risk

assessment in the ADC FEIS (USDA 1997, Appendix P). Those measures and characteristics should assure there would be no jeopardy to T&E species or adverse effects 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. Upon review of the list of T&E species listed below, Tennessee WS has determined that BDM activities will have no effect on those Tennessee T&E species not included in the 1992 Biological Opinion

T&E species that are Federally listed (or proposed for listing) for the State of Tennessee are:

MAMMALS:

Carolina Northern Flying Squirrel (*Glaucomys sabrinus coloratus*)
Gray Bat (*Myotis grisescens*)
Indiana Bat (*Myotis sodalis*)
Eastern Puma (*Puma concolor couguar*)

BIRDS:

Bald eagle (*Haliaeetus leucocephalus*)
Red cockaded woodpecker (*Picoides borealis*)
Interior least tern (*Sterna antillarum athalassos*

FISH:

Bluemask Darter (*Etheostoma (Doration) sp*)
Duskytail darter (*Etheostoma percnurum*)
Boulder Darter (*Etheostoma wapiti*)
Spotfin Chub (*Cyprinella monacha*)
Blue Shiner (*Cyprinella caeruleus*)
Palezone Shiner (*Notropis sp. (cf.N.procne*)
Smoky Madtom (*Noturus baileyi*)
Yellowfin Madtom (*Noturus flavipinnis*)
Pygmy Madtom (*Noturus stanauli*)
Amber Darter (*Percina antesella*)
Conasauga Logperch (*Percina jenkinsi*)
Pallid sturgeon (*Scaphirhynchus albus*)
Slender Chub (*Erimystax cahni*)
Slackwater Darter (*Etheostoma boschungi*)
Blackside dace (*Phoxinus cumberlandensis*)
Snail Darter (*Percina tanasi*)

CRUSTACEANS:

Nashville Crayfish (*Orconectes shoupi)*

MOLLUSKS:

Appalachian elktoe (*Alasmidonta raveneliana*)
Fanshell Mussel (*Cyprogenia stegaria*)
Birdwing Pearly Mussel (*Conradilla caelata*)
Dromedary Mussel (*Dromus dromas*)
Yellow-Blossom (*Epioblasma florentina florentina*)
Upland Combshell (*Epioblasma metasriata)*
Southern Acornshell (Epioblasma *othcaloogensis*)
Green-Blossom Pearly Mussel (*Epioblasma torulosa gubernaculum*)
Tuberculed-Blossom Pearly Mussel (*Epioblasma torulosa torulosa*)
Turgid-Blossom Pearly Mussel (*Epioblasma turgidula*)
Tan Riffleshell (*Epioblasma walkeri*)
Purple Cat's Paw Pearly Mussel (*Epioblasma obliquata obliquata*)
Fine-Rayed Pigtoe (*Fusconaia cuneolus*)
Shiny Pigtoe (*Fusconaia cor*)
Cracking Pearly Mussel (*Hemistena lata*)
Pink Mucket Pearly Mussel (*Lampsilis abrupta*)
Alabama Lamp Pearly Mussel (*Lampsilis virescens*)
Coosa Moccasinshell (*Medionidus parvulus*)
Ring pink Mussel (*Obovaria retusa*)
Little-Wing Pearly Mussel (*Pegias fabula*)
White Warty-Back Pearly Mussel (*Plethobasus cicatricosus*)
Orange-Footed Pearly Mussel (*Plethobasus cooperianus*)
Clubshell (*Pleurobema clava*)
Southern Clubshell (*Pleurobema decisum*)
Southern Pigtoe (*Pleurobema geogianum*)
Cumberland Pigtoe (*Pleurobema gibberum*)
Ovate Clubshell (*Pleurobema perovatum*)

Rough Pigtoe Pearly Mussel (*Pleurobema plenum*)
Triangular Kidneyshell (*Ptychobranchus greeni*)
Cumberland Monkeyface Pearly Mussel (*Quadrula intermedia*)
Winged Mapleleaf Mussel (*Quadrula fragosa*)
Appalachian Monkeyface Pearly Mussel (*Quadrula sparsa*)
Pale Lilliput Pearly Mussel (*Toxolasma cylindrella*)
Cumberland Bean Pearly Mussel (*Villosa trabalis*)
Painted Snake Coiled Forest Snail (*Anguispira picta*)
Anthony's Riversnail (*Athearnia anthonyi*)
Royal Snail (*Pyrgulopsis ogmorhaphe*)
Alabama Moccasinshell (*Medionidus acutissimus*)
Fine-Lined Pocketbook (*Lampsilis altilis*)
Purple Bean (*Villosa perpurpurea*)
Cumberlandian Combshell (*Epioblasma brevidens*)
Cumberland Elktoe (*Alasmidonta atropurpurea*)
Oyster Mussel (*Epioblasma capsaeformis*)
Rough Rabbitsfoot (*Quadrula cylindrica strigillata*)

ARCHANIDS:

Spruce-Fir Moss Spider (*Microhexura montivaga*)

INSECTS:
American Burying Beetle (*Nicrophorus americanus*)

Plants:

Price's potato-bean (*Apios priceana*)
Braun's rock cress (*Arabis perstellata*
Cumberland rosemary (*Conradina verticillata*)
Eggert's sunflower (*Helianthus eggertii*)
Cumberland sandwort (*Minuartia cumberlandensis*)
Virginia spiraea (*Spiraea virginiana*)
American Hart's-tongue Fern (*Asplenium scolopendrium americanum*)
Guthrie's Ground-Plum (*Astragalus bibullatus*)
Leafy Prairie-Clover (*Dalea foliosa*)
Tennessee Purple Coneflower (*Echinacea tennesseensis*)
Spreading Avens (*Geum radiatum*)
Rock Gnome Lichen (*Gymnoderma lineare*)
Roan Mountain Bluet (*Hedyotis purpurea montana*)
Small Whorled Pogonia (*Isotria medeoloides)*
Spring Creek Bladderpod *(Lesquerella perforata*)
Ruth's Golden Aster (*Pityopsis ruthii*)
Green Pitcher-Plant (*Sarracenia oreophilia*)
Large-Flowered Skullcap (*Scutellaria montana*)
Blue Ridge Goldenrod (*Solidago spithamaea*)
Virginia Spiraea (*Spiraea virginiana*)
Tennessee Yellow-Eyed Grass (*Xyris tennesseensis)*

5.1.2.2 Alternative 2 - Nonlethal BDM Only by WS

Under this alternative, WS take of nontarget animals would probably be less than that of the proposed action because no lethal control actions would be taken by WS. However, nontarget take would not differ substantially from the current program because the current program takes very few nontarget animals. On the other hand, people whose bird damage problems were not effectively resolved by nonlethal control methods would likely resort to other means of lethal control such as use of shooting by private persons or even illegal 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 damage and associated losses could lead to illegal use of chemical toxicants which could lead to unknown effects 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.

5.1.2.3 Alternative 3 - Technical Assistance Only

Alternative 3 would not allow any WS direct operational BDM in Tennessee. There would be no impact on nontarget or T&E species by WS activities from this alternative. 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. It is hypothetically possible that, similar to but probably less than under Alternative 2, frustration caused by the inability to reduce damage and associated losses could lead to illegal use of chemical toxicants which could lead to unknown effects on local nontarget species populations, including some T&E 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.

5.1.2.4 Alternative 4 - No Federal WS Bird Damage Management

Alternative 4 would not allow any WS BDM in the State. There would be no impact on nontarget or T&E species by WS 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 damage and associated losses could lead to illegal use of chemical toxicants which could impact local nontarget species populations, including some T&E 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.

5.1.3 Effects on Human Health and Safety

5.1.3.1 Effects of Chemical BDM Methods on Human Health by Alternative

Alternative 1 - Continue the Current Program (Proposed Action / No Action)

DRC-1339 DRC-1339 is the primary lethal chemical BDM method that would be used under the current program alternative. 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.
The Tennessee WS program used a total of 822 grams of DRC-1339 during the past three years (FY 1999-2001) with a range of 165 - 387 grams, (Table B-1). This chemical is one of the most extensively researched and evaluated pesticides ever developed. Over 30 years of studies have demonstrated the safety and efficacy of this compound. Appendix B provides more 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:

- its use is prohibited within 50 feet of standing water and cannot be applied directly to food or feed crops
- 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 treated bait material generally is nearly 100% broken down within a week.
- it is more than 90% metabolized in target birds within the first few hours after they consume the bait. Therefore, little material is left in bird carcasses that may be found or retrieved by people.
- application rates are extremely low (less than 0.1 lb. of active ingredient per acre) (EPA 1995).
- a human 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.
- The EPA has 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). Notwithstanding, 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 might be used by WS in BDM. 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. Appendix B provides more detailed information on this chemical.

Avitrol is available as a prepared grain bait mixture or as a powder. It is formulated in such a way that ratios of treated baits to untreated baits are no greater than 1:9. Use has been extremely limited in the Tennessee WS program — over the 3-year period of FY 1999-2001 WS used a total

of 1128 grams (36.28 ounces) of technical Avitrol in all baits. This represents an average of 376 grams (13.2 ounces) per year for the period. These applications killed a total of 145 English sparrows. In addition to this limited use, other factors that virtually eliminate health risks to members of the public from use of this product as an avicide are:

- It is readily broken down or metabolized into removable compounds that are excreted in urine in the target species (ETOXNET 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. Notwithstanding, the extremely controlled and limited circumstances in which Avitrol is used would prevent exposure of members of the public to this chemical.

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

Other BDM Chemicals. Other nonlethal BDM chemicals that might be used or recommended by WS would include repellents such as methyl or di-methyl anthranilate (artificial grape flavoring used in foods and soft drinks sold for human consumption), which has been used as an area repellent, anthraquinone which is presently marketed as Flight Control, and the tranquilizer drug alpha-chloralose. 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 would be in accordance with labeling requirements under FIFRA and State pesticide laws and regulations which are established to avoid unreasonable adverse effects on the environment. Following labeling requirements and use restrictions are a built-in mitigation measure that would assure that use of registered chemical products would avoid significant adverse effects on human health.

Based on a thorough Risk Assessment, APHIS concluded that, when WS program chemical methods are used in accordance with label directions, they are highly selective to target individuals or populations, and such use has negligible effects on the environment (USDA 1997).

Alternative 2 - Nonlethal BDM Only by WS

Alternative 2 would not allow for any lethal methods use by WS in the State. WS could only implement nonlethal methods such as harassment and exclusion devices and materials. Nonlethal methods could, however, include the tranquilizer drug alpha-chloralose and chemical repellents such as anthraquinone and methyl anthranilate which, although already considered safe for human consumption because it is artificial grape flavoring, which might nonetheless raise concerns about human health risks. 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 are 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 entities rejecting WS's assistance and resorting to other means of BDM. Such means could include illegal pesticide uses. Evidence of illegal pesticide use was found several years ago in the City of Carlsbad, New Mexico when a dead hawk found near some dead pigeons was determined to have died from strychnine poisoning presumably from feeding on strychnine poisoned pigeons ([redacted], USDA, APHIS, WS, Roswell, NM Pers. Comm. 1999).

Alternative 3 - Technical Assistance Only

Alternative 3 would not allow any direct operational BDM assistance by WS in the State. WS would only provide advice and, in some cases, equipment or materials (i.e., by loan or sale) to other persons who would then conduct their own damage management actions. Concerns about human health risks from WS's use of chemical BDM methods would be alleviated because no such use would occur. DRC-1339 is only registered for use by WS personnel and would not be available for use by private individuals. WS would neither provide these chemicals nor supervise the use of these chemicals under this alternative. 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 No Action/Proposed Action alternative. However, because some of these private parties would be receiving advice and instruction from WS, concerns about human health risks from chemical BDM methods use should be less than under Alternative 2. Commercial pest control services would be able to use Avitrol and such use would likely occur to a greater extent in the absence of WS's assistance. Use of Avitrol in accordance with label requirements should preclude any hazard to members of the public. Hazards to humans and pets could be greater under this alternative if chemicals that are less selective or that cause secondary poisoning are used. It is hypothetically possible that frustration caused by the inability to alleviate bird damage could lead to illegal use of certain toxicants that, unlike WS'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.

Alternative 4 - No Federal WS Bird Damage Management

Alternative 4 would not allow any WS BDM in the State. Concerns about human health risks from WS's use of chemical BDM methods would be alleviated because no such use would occur. DRC-1339 is only registered for use by WS personnel and would not be available for use by private individuals. Private efforts to reduce or prevent damage would be expected to increase, resulting in less experienced persons implementing damage management methods and potentially leading to greater risk to human health and safety than the Current Program alternative. Commercial pest control services would be able to use Avitrol and such use would likely occur to a greater extent in the absence of WS's assistance. Use of Avitrol in accordance with label requirements should preclude any hazard to members of the public. However, hazards to humans and pets could be

greater under this alternative if other chemicals that are less selective or that cause secondary poisoning are used. It is hypothetically possible that frustration caused by the inability to alleviate bird damage could lead to illegal use of certain toxicants that, unlike WS'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.

5.1.3.2 Effects on Human Safety of Nonchemical BDM Methods by Alternative

Alternative 1 - Continue the Current Program (Proposed Action / No Action)

Nonchemical BDM methods that might raise safety concerns include shooting with firearms and harassment with pyrotechnics. Firearms are only used by WS personnel who are experienced in handling and using them. WS personnel receive safety training on a periodic basis to keep them aware of safety concerns. The Tennessee WS program has had no accidents involving the use of firearms or pyrotechnics in which a member of the public was harmed. A formal risk assessment of WS's operational management methods found that risks to human safety were low (USDA 1997, Appendix P). Therefore, no significant effects on human safety from WS's use of these methods is expected.

Alternative 2 - Nonlethal BDM Only by WS

Under this alternative, nonchemical BDM methods that might raise safety concerns include shooting with firearms when used as a harassment technique and harassment with pyrotechnics. Firearms are only used by WS personnel who are experienced in handling and using them. WS personnel receive safety training on a periodic basis to keep them aware of safety concerns. The Tennessee WS's program has had no accidents involving the use of firearms or pyrotechnics in which a member of the public was harmed. A formal risk assessment of WS's operational management methods found that risks to human safety were low (USDA 1997, Appendix P). Therefore, no adverse effects on human safety from WS's use of these methods is expected.

Alternative 3 - Technical Assistance Only

Under this alternative, WS would not engage in direct operational use of any nonchemical BDM methods. Risks to human safety from WS's use of firearms and pyrotechnics would be lower than the current program alternative, but not significantly because Tennessee WS's current BDM program has an excellent safety record in which no accidents involving the use of these devices have occurred that have resulted in a member of the public being harmed. Increased use of firearms and pyrotechnics by less experienced and poorly or improperly trained private individuals would probably occur without WS direct operational assistance which would likely increase human safety risks somewhat. Similar to Alternative 2, however, it is unlikely that these increased risks would become significant.

Alternative 4 - No Federal WS Bird Damage Management

Alternative 4 would not allow any WS BDM in the State. Concerns about human health risks from WS's use of nonchemical BDM methods would be alleviated because no such use would occur. The use of firearms or pyrotechnics by WS would not occur in BDM activities in the State. However, private efforts to reduce or prevent damage would be expected to increase, resulting in

less experienced persons implementing damage management methods and potentially leading to greater risk to human health and safety than the Current Program alternative. Commercial pest control services would be able to use pyrotechnics or firearms in BDM programs and this activity would likely occur to a greater extent in the absence of WS's assistance. Hazards to humans and property could be greater under this alternative if personnel conducting BDM activities using nonchemical methods are poorly or improperly trained. It is hypothetically possible that frustration caused by the inability to alleviate bird damage could also lead to illegal use of such methods. Several Local governments in Tennessee require special waivers of existing urban firearms or projectile laws before some nonchemical methods equipment, such as pellet rifles, shotguns, or pyrotechnic launchers can be used.

5.1.3.3 Effects on Human Health by Injurious Birds for Which BDM Is Requested by Alternative

Alternative 1 - Continue the Current Program (Proposed Action / No Action)

As discussed in Chapter 1, feral domestic pigeons, European starlings, blackbirds, and English sparrows can all carry or be involved in the cycle of diseases that are transmittable to humans and that can adversely affect human health. In most cases, it is difficult to conclusively prove that birds were responsible for transmission of individual human cases or outbreaks of bird-borne diseases. Nonetheless, certain requesters of BDM service may consider this risk to be unacceptable and may request such service primarily for that reason. In such cases, BDM, either by lethal or nonlethal means, would, if successful, reduce the risk of bird-borne disease transmission at the site for which BDM is requested.

In some situations such as those involving urban feral domestic pigeons and European starlings, the implementation of nonlethal controls such as electric or porcupine wires, netting barriers, and harassment dispersal in the case of European starlings, etc. could actually increase the risk of human health problems at other sites by causing the birds to move to other urban roosting sites not previously affected. In such cases, lethal removal of the birds may actually be the best alternative from the standpoint of overall human health concerns in the local area.

Aside from human health concerns, another reason lethal removal may be a better alternative is that the costs of nonlethal exclusion would likely have to be borne at each new site where the displaced birds reestablished roosting and nesting habits. The costs of installing and maintaining nonlethal exclusion methods at multiple sites could be much greater, even over the long term, than the cost of periodic lethal control using DRC-1339.

Alternative 2 - Nonlethal BDM Only by WS

Under this alternative, WS would be restricted to implementing only nonlethal methods in providing assistance with bird damage problems. Entities requesting BDM assistance for human health concerns would only be provided information on nonlethal barriers or exclusion devices, habitat alteration, or other nonlethal methods such as harassment. Because some of these nonlethal methods would likely be effective at the individual sites where they are used, this alternative would likely create or increase human health risks at other locations to where the birds would then move. Some requesting entities such as city government officials would reject WS assistance for this reason and would likely seek to achieve bird control (e.g., urban

pigeon problems) by other means. Because DRC-1339 would not be available for use by non-WS personnel, it may be difficult to achieve local population reduction. In such cases, human health risks may remain the same or become worse. Also, under this alternative, human health problems would probably increase if private individuals were unwilling to implement nonlethal control methods because of high cost or lack of faith in their effectiveness, or if they were unable to hire other entities to conduct effective BDM for human health concerns.

Alternative 3 - Technical Assistance Only

With WS technical assistance but no direct operational assistance, entities requesting BDM for human health concerns would either (1) not take any action which means the risk of human health problems would continue or would increase in each situation as European starling or pigeon numbers maintained or increased, (2) implement WS recommendations for nonlethal barriers and exclusions site-by-site, which would most probably result in European starlings or pigeons relocating to other buildings, structures, or tree roosts in the case of European starlings, and thereby creating or increasing human health risks at new sites, or (3) undertake or hire European starling or pigeon control using cage traps, shooting, or Avitrol. DRC-1339 would not be available for use. WS would neither provide these chemicals nor supervise the use of these chemicals under this alternative. Under this alternative, human health problems could increase if private individuals were unable to achieve effective BDM with technical assistance alone, or if they were unable to hire other entities to conduct effective BDM for human health concerns.

Alternative 4 - No Federal WS Bird Damage Management

With no WS assistance, private individuals and community government officials would either (1) not take any action which means the risk of human health problems would continue or would increase in each situation as European starling or pigeon numbers maintained or increased, (2) implement nonlethal barriers and exclusions site-by-site, which would most probably result in European starlings or pigeons relocating to other buildings, structures, or tree roosts, in the case of European starlings, and thereby creating or increasing human health risks at new sites, or (3) undertake or hire European starling or pigeon control using cage traps, shooting, or Avitrol. A primary difference between this alternative and the proposed action is that DRC-1339 would not be available. Under this alternative, human health problems could increase if private individuals were unable to find and implement effective means of controlling pigeons or other birds that cause similar types of damage problems.

5.1.4 Effects on Aesthetics

5.1.4.1 Effects on Human Affectionate-Bonds With Individual Birds and On Aesthetic Values of Wild Bird Species

Alternative 1 - Continue the Current Program (Proposed Action / No Action)

Some people who routinely view or feed individual birds such as feral domestic pigeons or urban waterfowl would likely be disturbed by removal of such birds under the current program. WS is aware of such concerns and has taken it into consideration in some cases to mitigate them. For example, in a recent situation involving nuisance duck damage to property as a result of droppings, at least one adjacent homeowner who enjoyed viewing feral domestic ducks on one of the water course areas was concerned that WS would remove the ducks she was accustomed to

seeing and feeding. WS agreed not to remove the ducks. In yet another instance involving damage by geese, WS received a request to leave a few geese for the benefit of those who enjoyed observing and feeding them. WS subsequently live captured and translocated more than 50 geese but left seven as requested. 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, some lethal control of birds would continue and these persons would continue to be opposed. However, many persons who voice opposition have no direct connection or opportunity to view or enjoy the particular birds that would be killed by WS'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.

Alternative 2 - Nonlethal BDM Only by WS

Under this alternative, WS would not conduct any lethal BDM but would still conduct harassment of European starlings, blackbirds, some geese, and other birds that were causing damage. In addition, WS could live-capture waterfowl such as feral domestic or Canada geese, and ducks, and translocate them to alternative sites in Tennessee. Some people who oppose lethal control of wildlife by government but are tolerant of government involvement in nonlethal wildlife damage management would favor this alternative. Persons who have developed affectionate bonds with individual wild birds would not be affected by the death of individual birds under this alternative, but might oppose dispersal or translocation of certain birds. As discussed in this Subsection under Alternative One, WS might sometimes be able to mitigate such concerns by leaving certain birds which might be identified by interested individuals. In addition, the abundant populations of European starlings, blackbirds, geese and ducks in urban environments would enable people to continue to view them and to establish affectionate bonds with individual wild birds. Although WS would not perform any lethal activities under this alternative, other private entities would likely conduct BDM activities similar to those that would no longer be conducted by WS, which means the effects would then be similar to the current program alternative.

Alternative 3 - Technical Assistance Only

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

Alternative 4 - No Federal WS Bird Damage Management

Under this alternative, WS would not conduct any lethal removal of birds nor would the program

conduct any harassment of European starlings, blackbirds, geese or other birds. Some people who oppose any government involvement in wildlife damage management would favor this alternative. Persons who have developed affectionate bonds with individual wild birds would not be affected by WS's activities under this alternative. However, other private entities would likely conduct BDM activities similar to those that would no longer be conducted by WS, which means the effects would then be similar to the current program alternative.

5.1.4.2 Effects On Aesthetic Values of Property Damaged by Birds

Alternative 1 - Continue the Current Program (Proposed Action / No Action)

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. In addition, individuals who object to the presence of invasive nonnative species, such as European starlings, domestic feral pigeons, and English sparrows, and whose aesthetic enjoyment of other birds is diminished by the presence of such species, will be positively affected by programs which result in reductions in the presence of such birds.

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

Live capture and translocation of damaging waterfowl by WS would aesthetically improve sites such as residential neighborhoods, business parks, recreational parks, and public property since such relocation of offending birds would reduce droppings and sometimes alleviate damage to lawns and water bodies. However, removal of some geese or ducks might reduce opportunities for the public to view the birds at those sites. Some people might therefore, object to capturing birds and transporting them elsewhere. With populations of waterfowl in urban areas at unprecedented numbers in Tennessee, those who wish to view these species should be able to find them in abundance nearby and would still be able to pursue this pastime without undue difficulty. In addition, rarely does a WS BDM action related to waterfowl result in the removal of all birds from one site, and, as discussed elsewhere, new birds often quickly move into an area where birds have been removed.

Lethal removal of birds, including geese and ducks, from airports should not affect the public's enjoyment of the aesthetics of the environment since airport property is closed to the public and access to view birds at these sites is either restricted to viewing from a location outside boundary fences or is forbidden, and feeding of wildlife on airports is usually forbidden.

Alternative 2 - Nonlethal BDM Only by WS

Under this alternative, WS 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.

Alternative 3 - Technical Assistance Only

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

Relocation of nuisance roosting or nesting population of birds (e.g., blackbird/starling roosts, heron rookeries) through harassment, barriers, or habitat alteration can sometimes result in the birds causing the same problems at the new location. If WS 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 addition technical assistance only could result in a greater chance of adverse effects on aesthetics of property owners at other locations than the current program alternative.

Alternative 4 - No Federal WS Bird Damage Management

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

5.1.5 Humaneness of Lethal Bird Control Methods

5.1.5.1 Alternative 1 - Continue the Current Program (Proposed Action / No Action)

Under this alternative, methods viewed by some persons as inhumane would continue to be used in BDM by WS. These methods would include shooting and toxicants/chemicals such as DRC-1339 and Avitrol.

Shooting, when performed by experienced professionals, usually results in a quick death for target birds. Occasionally, however, some birds are initially wounded and must be shot a second time or must be caught by hand and then dispatched or euthanized. Some persons would view shooting as inhumane.

The primary lethal chemical BDM method that would be used by WS under this alternative would be DRC-1339. This chemical causes a quiet and apparently painless death that results from uremic poisoning and congestion of major organs (Decino et al. 1966). The birds become listless and lethargic, and a quiet death normally occurs in 24 to 72 hours following ingestion. However, the method appears to result in a less stressful death than that which probably occurs by most natural causes which are primarily disease, starvation, and predation. For these reasons, WS considers DRC-1339 use under the current program to be a relatively humane method of lethal

BDM. However, despite the apparent painlessness of the effects of this chemical, some persons will view any method that takes a number of hours to cause death as inhumane and unacceptable.

The chemical Avitrol repels birds by poisoning a few members of a flock, causing them to become hyperactive (see discussion in Appendix B). Their distress calls generally alarm the other birds and cause them to leave the site. Only a small number of birds need to be affected to cause alarm in the rest of the flock. The affected birds generally die. In most cases where Avitrol is used, only a small percentage of the birds are affected and killed by the chemical with the rest being merely dispersed. In experiments to determine suffering, stress, or pain in affected animals Rowsell, et. al. (1979) tested Avitrol on pigeons and observed subjects for clinical, pathological, or neural changes indicative of pain or distress. None were observed. Conclusions of the study were that the chemical met the criteria for a humane pesticide. Notwithstanding, some persons would view Avitrol as inhumane treatment of the birds that are affected by it based on the birds' distress-like behavior.

Occasionally, birds captured alive by use of the tranquilizer Alpha-chloralose, cage traps, or by hand or with nets would be euthanized. The most common method of euthanization would be by decapitation, cervical dislocation or CO_2 gas which are described and approved by AVMA as humane euthanasia methods (Beaver et al. 2001). Most people would view AVMA-approved euthanization methods as humane.

5.1.5.2 Alternative 2 - Nonlethal BDM Only by WS

Under this alternative, lethal methods viewed as inhumane by some persons would not be used by WS. However, it is expected that many requesters of BDM assistance would reject nonlethal methods recommended by WS and/or would not be willing to pay the extra cost of implementing and maintaining them and would seek alternative lethal means.

Since DRC-1339 would not be available to non-WS entities, the only chemical BDM method that could be legally used by these entities would be Avitrol. Avitrol would most likely be viewed as less humane than DRC-1339 because of the distress behaviors that it causes.

Shooting could be used by non-WS entities and, similar to the current program alternative, would be viewed by some persons as inhumane.

Alpha-chloralose would not be available to non-WS entities. However, live trapping/capture by other methods and euthanization by decapitation, cervical dislocation or CO_2 gas could be used by these entities.

Overall, it is likely that BDM would actually be somewhat less humane with this alternative than under the current program alternative.

5.1.5.3 Alternative 3 - Technical Assistance Only

Under this alternative, WS would not conduct any lethal or nonlethal BDM, but would provide self-help advice only. Thus, lethal methods viewed as inhumane by some persons would not be used by WS.

Without WS direct operational assistance, it is expected that many requesters of BDM would reject nonlethal recommendations or would not be willing to pay the extra cost of implementing and maintaining them and would seek alternative lethal means.

DRC-1339 would not be available for use. WS would neither provide these chemicals nor supervise the use of these chemicals under this alternative. Thus, the only chemical BDM method legally available to non-WS personnel would be Avitrol which would be viewed by many persons as less humane than DRC-1339.

The other lethal method that would likely be used more by non-WS entities would be shooting, which would also be viewed by some persons as inhumane.

Alpha-chloralose would not be available to non-WS entities. However, live trapping/capture by other methods and euthanization by decapitation, cervical dislocation or CO_2 gas could be used by these entities.

Overall, BDM under this alternative would likely be somewhat less humane than the current program alternative but slightly more humane than Alternative 2.

5.1.5.4 Alternative 4 — No Federal WS Bird Damage Management

Under this alternative, lethal methods viewed as inhumane by some persons would not be used by WS. However, it is expected that many requesters of BDM assistance would reject the use of nonlethal methods as being impractical or too expensive to implement and maintain, and would seek alternative lethal means.

Similar to Alternative 2, DRC-1339 would no longer be available for use since it is only registered for use by or under the direct supervision of WS personnel. Thus, the only chemical BDM method legally available would be Avitrol which would be viewed by many persons as less humane than DRC-1339. In these situations, BDM would most likely be less humane than under the current program alternative.

Shooting could be used by non-WS entities and, similar to the current program alternative, would be viewed by some persons as inhumane.

Alpha-chloralose would not be available to non-WS entities. However, live trapping/capture by other methods and euthanasia by decapitation, cervical dislocation or CO_2 gas could be used by these entities.

Overall, it is likely that BDM would actually be somewhat less humane with this alternative than under the current program alternative, somewhat less humane than under Alternative 2, and somewhat less humane than under Alternative 3.

5.2 CUMULATIVE IMPACTS OF BDM METHODS BY ALTERNATIVE

Cumulative impacts, as defined by CEQ (40 CFR 1508.7), are impacts to the environment that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts may result from individually minor, but collectively significant, actions taking place

over time. The potential for cumulative impacts for all four alternatives presented in this EA is examined in the following Subsections.

5.2.1 Alternative 1 - Continue the Current Program (Proposed Action / No Action)

Under the current program, WS addresses damage associated with birds in a number of situations throughout the State and is expected to continue at the present level or to increase slightly in the near future. The WS BDM program is the primary Federal program with BDM responsibilities, but some State and Local government agencies may conduct BDM activities in Tennessee. Through ongoing coordination with these agencies, WS is aware of such BDM activities and sometimes provides technical assistance in such efforts. WS does not normally conduct direct damage management activities concurrently with such agencies in the same area but may conduct BDM activities at adjacent sites within the same time frame. In addition, commercial pest control companies may conduct BDM activities in the same area. The potential cumulative impacts analyzed below could occur either as a result of WS BDM program activities over time, or as a result of the aggregate effects of those activities combined with the activities of other agencies and individuals.

5.2.1.1 Cumulative Impact Potential From Chemical Components of Alternative 1

BDM programs which include lethal population management components using pesticides may have the greatest potential for cumulative impacts on the environment as such impacts relate to deposit of chemical residues in the physical environment and environmental toxicosis. The avicide DRC-1339 and the frightening agent Avitrol are the only two chemicals used in the Tennessee WS BDM program for the purpose of obtaining lethal effects on birds. These two chemicals have been evaluated for possible residual effects which might occur from buildup of the chemicals in soil, water, or other environmental sites. DRC-1339 exhibits a low persistence in soil or water, and bio-accumulation of the chemical is unlikely (USDA 1997). In addition, the relatively small quantity of DRC-1339 used in BDM programs in Tennessee, the chemical's instability which results in speedy degradation of the product (see Subsection 5.1.3.1 and Appendix B), and application protocol used in WS programs further reduces the likelihood of any environmental accumulation. DRC-1339 is not used by any other entities in Tennessee.

In BDM programs in Tennessee, WS uses Avitrol in small quantities (see Subsection 5.1.3.1 and Appendix B). During FY 1999-2001 WS used a total of 1128 grams (36.28 ounces) of Avitrol. This represents a yearly average of 376 grams (13.2 ounces). A typical application involves the use of less than .25 grams (.009 ounces) of technical chemical. Most applications are not in contact with soil, no applications are in contact with surface or ground water, and uneaten baits are recovered and disposed of according to EPA label specifications.

Avitrol is also used occasionally by various pest control companies in Tennessee to address damage associated with birds such as domestic feral pigeons, European starlings, and English sparrows. No precise usage data was available for commercial pest control operators regarding use of Avitrol by them in Tennessee.

Avitrol exhibits a high persistence in soil and water but, according to literature, does not bioaccumulate (USDA 1997 and EXTOXNET 2000). Because of Avitrol's characteristic of binding to soils it is not expected to be present in surface or ground water as a result of its use

on land (EPA 1980). A combination of chemical characteristics and baiting procedure used by WS reduces the likelihood of environmental accumulation of Avitrol as a result of its use in WS BDM programs in Tennessee. The EPA has not required studies on the fate of Avitrol in the soil because, based on use patterns of the avicide, soil residues are expected to be low (EPA 1980).

Based on use patterns, chemical and physical characteristics of pesticides used in Tennessee BDM programs, and factors related to environmental fate of DRC-1339 and Avitrol, no cumulative impacts are expected from this lethal chemical components used in the WS BDM program.

Non-lethal chemicals used in the Tennessee BDM program are discussed in Subsection 4.2.4 and in Appendix B. Characteristics of these chemicals and use patterns by those who employ them in Tennessee indicate that no significant cumulative impacts related to environmental fate are expected from their use in BDM programs in the State.

Another potential cumulative impact related to the use of chemical methods in the current Tennessee BDM program is the potential for such techniques to have adverse effects on populations of target or nontarget species, including T & E species. Aspects of current Tennessee BDM program methods and a discussion of current trends in potentially affected bird populations is presented in detail in Subsections 5.1.1 and 5.1.2. As discussed, current program activities have had no observable cumulative effects on bird populations in the state for the past three fiscal years. Trends indicate that bird populations of potentially affected species have either increased, remained stable, or decreased slightly for Tennessee and the Eastern BBS region.

5.2.1.2 Cumulative Impact Potential From Non-Chemical Components of Alternative 1

Nonchemical methods of the WS BDM program in Tennessee may include exclusion through use of various barriers, habitat modification of structures or vegetation, live trapping and translocation or euthanasia of birds, harassment dispersal of birds or bird flocks, and shooting of some birds.

Because shooting is one component of the nonchemical WS BDM program in Tennessee, the deposition of lead shot in the environment is a factor considered in this EA.

Threats of lead toxicosis to waterfowl from the deposition of lead shot in waters where such species fed were observed more than one hundred years ago (Sanderson and Belrose 1986). As a result of discoveries made regarding impacts to several species of ducks and geese, Federal restrictions were placed on the use of lead shot for waterfowl hunting in 1991. Regulations regarding this are found in 50CFR20.21. TWRA addresses the use of lead shot related to waterfowl hunting in Department of Tennessee Wildlife Resources, Authorization No. 328652, Tennessee Waterfowl Hunting Guide 2001. Language used by the guide states that “All federally approved nontoxic shot (steel, bismuth-tin, tungsten-iron, tungsten-polymer, tungsten-matrix, or tungsten-nickel-iron) are legal for waterfowl hunting. Possession or use of any loose shot other than nontoxic shot or any shotgun shells other than nontoxic while hunting waterfowl, coots, gallinules, Virginia rails, and sora rails is prohibited.” Comparable language in 50CFR20.21 directs hunters that: “While possessing

shot (either in shotshells or as loose shot for muzzleloading) other than steel shot, or bismuth-tin (97 parts bismuth: 3 parts tin with 1 percent residual lead) shot, or tungsten-iron (40 parts tungsten: 60 parts iron with 1 percent residual lead) shot, or tungsten-polymer (95.5 parts tungsten: 4.5 parts Nylon 6 or 11 with 1 percent residual lead) shot, or tungsten matrix (95.5 parts tungsten: 4.1 parts polymer with 1 percent residual lead) shot or such shot approved as nontoxic by the Director pursuant to procedures set forth in 20.134, provided that: (1) This restriction applies only to the taking of Anatidae (ducks, geese [including brant] and swans), coots (*Fulica americana*) and any species that make up aggregate bag limits during concurrent seasons with the former in areas described in Sec. 20.108 as nontoxic shot zones...." Nontoxic shot zones are defined in 50CFR20.108 in the following citation: "Beginning September 1, 1991, the contiguous 48 United States, and the States of Alaska and Hawaii, the Territories of Puerto Rico and the Virgin Islands, and the territorial waters of the United States, are designated for the purpose of Sec. 20.21 (j) as nontoxic shot zones for hunting waterfowl, coots, and certain other species. 'Certain other species' refers to those species, other than waterfowl or coots, that are affected by reason of being included in aggregate bags and concurrent seasons."

All WS BDM shooting activities conform to Federal, State and Local laws. In some programs WS sometimes finds it necessary to shoot waterfowl under existing permits granted by USFWS (See Subsection 1.7.2.3), usually in airport wildlife hazard management programs where ducks or geese near aircraft operations jeopardize air passenger safety. If such activities are conducted near or over water, WS uses steel shot during activities. Consequently, no deposition of lead in nontoxic shot zones occurs as a result of WS BDM actions in Tennessee. No cumulative impacts are expected therefore, related to toxic shot and shooting as a method in the Tennessee WS BDM program. In addition, WS will evaluate other BDM actions which entail the use of shot on a case by case basis to determine if deposition of lead shot poses any risk to nontarget animals, such as domestic livestock, in scenarios such as that discussed in Subsection 2.3.2. If such risk exists, WS will use nontoxic shot in those situations.

Some potential exists for cumulative impacts to human health and safety related to harassment of roosting bird flocks such as American crows, blackbirds, and European starlings in urban environments. If birds are dispersed from one site and relocate in another where human exposure to concentrations of bird droppings over time occurs, human health and safety threats can occur (See Subsection 1.3.2). However, WS uses IWDM strategies to address such bird damage in Tennessee. Such strategies may result in the implementation of either or both of the following: habitat modifications to problem areas or population reductions of American crow, blackbird and European starling numbers which are causing human health and safety impacts. The potential for harassment/dispersal and subsequent relocation of flocks of birds to produce cumulative impacts as a result of their presence in areas of human use is therefore reduced or eliminated by the overall WS BDM strategy. Consequently, no cumulative impacts are expected from the use of harassment or other dispersal methods which might relocate flocks of roosting American crows, blackbirds, or European starlings to other human-occupied sites.

No cumulative impacts affecting target or nontarget species of wildlife, including threatened and endangered species, are expected as a result of this alternative.

5.2.2 Alternative 2 - Nonlethal BDM Only by WS

Under this alternative, WS would be restricted to implementing only nonlethal methods in providing assistance with bird damage problems. Entities requesting BDM assistance for damage concerns would only be provided information on nonlethal barriers or exclusion devices, habitat alteration, or other nonlethal methods such as harassment for most species. An exception might be that nonlethal live-capture and translocation of migratory waterfowl and harassment dispersal of European starling and blackbird roosts could still be performed by WS.

Because some of these nonlethal methods would likely be effective at the individual sites where they were used, this alternative would likely create or increase human health risks and property damage at other locations where the birds would be moved. Because of this likelihood a nonlethal only program by WS might result in increasing and recurrent problems of this nature. The scope of human health threats and property damage could conceivably increase as birds causing damage continued to increase in numbers and occupy areas of human use. However, no cumulative impacts directly related to the chemical or nonchemical methods used under this alternative would be expected.

No cumulative impacts affecting target or nontarget species of wildlife, including threatened and endangered species, are expected as a result of this alternative.

5.2.3. Alternative 3 - Technical Assistance Only

With WS technical assistance but no direct operational assistance, entities requesting BDM for human health and safety concerns, property, agricultural, or natural resource damage would either (1) not take any action which means the risk of damage by birds would continue or would increase in each situation as numbers of damaging birds maintained or increased, (2) implement WS recommendations for nonlethal barriers and exclusions site-by-site, which would probably result in some birds such as European starlings, pigeons, or English sparrows relocating to other buildings, structures, or tree roosts in the case of European starlings and English sparrows, and thereby creating or increasing damage risks at new sites, or (3) undertake or hire bird damage control using dispersal methods, cage traps, shooting, or Avitrol. Under this alternative bird-caused damage could increase if private individuals were unable to achieve effective BDM with technical assistance alone, or if they were unable to hire other entities to conduct effective BDM. This could result in cumulative damage effects to human health and safety, property, agriculture, or natural resources similar to Alternative 2.

Some cumulative impacts to waterfowl populations might occur from implementation of this alternative. Under this alternative, urban populations of ducks and geese could be expected to increase, which normally results in an increase in levels of certain waterfowl diseases such as avian cholera and botulism (Davidson and Nettles 1997), which are lethal to such species.

5.2.4 Alternative 4 - No Federal WS Bird Damage Management

With no WS assistance, private individuals, communities, and government officials might either (1) not take any action which means the risk of bird caused damage could continue or increase in each situation as damaging bird species numbers maintained or increased, (2) implement environmental manipulation in the form of tree -cutting or thinning, installation of nonlethal barriers and exclusionary devices site-by-site, and cease growing crops, or change to other crop types in the case of agricultural damage, which might result in damaging birds relocating to other buildings, structures, farms or crop fields, or tree roosts, and thereby creating or increasing human health risks, or crop or property damage at new sites, or (3) undertake or hire bird damage management using various exclusionary or bird-dispersal techniques, cage traps, shooting, or Avitrol. A primary difference

between this alternative and the proposed action is that DRC-1339 would not be available. Under this alternative, bird damage problems could increase if private individuals were unable to find and implement effective means of controlling those species causing damage. This increase might result in cumulative impacts to agriculture, human health and safety, property, or natural resources as a result of increased levels of unresolved bird damage.

Some cumulative impacts to waterfowl populations might occur from implementation of this alternative. Under this alternative, urban populations of ducks and geese could be expected to increase, which normally results in an increase in levels of certain waterfowl diseases such as avian cholera and botulism (Davidson and Nettles 1997), which are lethal to such species.

No cumulative impacts affecting nontarget species of wildlife, including threatened and endangered species, are expected as a result of this alternative. Table 5-2. summarizes the expected effects of each of the alternatives on each of the issues.

Table 5-2. Relative Comparison of Anticipated Effects From Alternative In This EA.

Issues/Effects	Alt. 1 Current Program / No Action	Alt. 2 Nonlethal Only	Alt. 3 Technical Assistance (TA) Only	Alt. 4 No Federal Program
Target Species Effects	Low effect - reductions in bird numbers would not significantly affect species populations.	Low effect - reductions in bird numbers would not occur by WS reductions in bird numbers may occur by non-WS personnel but would also be insignificant to populations.	Low effect - reductions in bird numbers may occur by non-WS personnel but would also be insignificant to populations.	Low effect - reductions in bird numbers less likely w/o WS assistance, but would be insignificant to populations if they occurred.
Effects to Nontarget Species	Low effect - methods used by WS would be highly selective with minimal risk to nontarget species	Low effect but greater than Alt. 1 - people with bird problems may resort to less selective lethal methods if they reject WS recommended nonlethal methods	No effect by WS. Low effect by non-WS personnel, greater than Alt. 1, but less than Alt. 2 - people with bird problems may resort to less selective lethal methods, but less likely with WS TA	No effect by WS. Low effect by non-WS personnel, but greater than Alts. 1,2, or 3 - people with bird problems may resort to less selective lethal methods w/o WS assistance.

Issues/Effects	Alt. 1 Current Program / No Action	Alt. 2 Nonlethal Only	Alt. 3 Technical Assistance (TA) Only	Alt. 4 No Federal Program
Human Health and Safety - Risks of Adverse Effects from BDM Methods	Low risk - methods used by WS would be safe with minimal risk of human health or safety effects.	Low risk but slightly greater than Alt. 1 - people with bird problems may resort to illegal lethal chemical or other illegal methods that pose human health/safety risks.	No effect by WS. Low risk by non-WS personnel, slightly greater than Alt. 1, but slightly less than Alt. 2 - people with bird problems may resort to illegal lethal or other chemical methods that pose human health/safety risks; less likely with WS TA	No effect by WS. Low risk by non-WS personnel,, but greater than Alts. 1,2, or 3 - people with bird problems may resort to illegal lethal chemical or other methods that pose human health/safety risks; most likely w/o WS direct or TA assistance.
Human Health and Safety- Risks of Adverse Effects from Bird Damage	Low risk - bird damage problems most likely to be resolved without creating or moving problems elsewhere.	Higher risks - e.g. pigeons and starlings would move to other sites which can create health risks at new sites.	Higher risks, but less than Alt. 2 - e.g. TA recipients might be able to mitigate problem, but less likely w/o WS direct assistance.	Higher risk than Alt. 1,2, but less than Alt. 3 - people with BDM problems might be able to achieve success, but less likely w/o WS direct or TA assistance.
Aesthetic Enjoyment of Birds	Low to Moderate effect (at local levels only) - WS BDM does not adversely affect overall bird species populations but may be local reductions (e.g. feral pigeon BDM)	Low effect - bird numbers in BDM situations would remain high or would increase, unless nonlethal recommendations were rejected and bird numbers were reduced by non-WS entities.	No effect by WS. Low effect by non-WS personnel (at local levels) - bird numbers in BDM situations would remain high or would increase unless TA recipients implemented lethal methods successfully.	No effect by WS. Low effect by non-WS personnel - bird numbers in BDM situations would remain high or would increase unless bird numbers were reduced by non-WS entities.
Aesthetic Damage by Birds	Low effect - bird damage problems most likely to be resolved without creating or moving problems elsewhere.	Low to Moderate effect - e.g. birds would move to other sites which could create aesthetic damage problems at new sites.	High, greater than Alts 1,2 but less than Alt. 4 - nuisance bird problems less likely to be resolved w/o WS assistance.	High - nuisance bird problems less likely to be resolved w/o WS assistance.
Humaneness of Lethal BDM Methods	Low to Moderate effect - methods viewed by some people as inhumane would be used, but current program would still be largely nonlethal.	Lower effect than Alt. 1 - but some people with bird problems may resort to other, less selective lethal methods than used by WS.	No effect by WS. Lower effect than Alt. 1, but greater than Alt. 2 - some people with bird problems may resort to other, less selective methods, but less likely with WS TA assistance.	No effect by WS. Lower effect than Alt. 1, 3 but greater than Alt. 2 - some people with bird problems may resort to other, less selective methods w/o WS direct or TA assistance.

6.0 CHAPTER 6 - PREPARERS/REVIEWERS, PERSONS CONSULTED, AND PUBLIC INVOLVEMENT

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APPENDIX A

LITERATURE CITED

AVMA (American Veterinary Medical Association). 1987. Journal of the American Veterinary Medical Association. Panel Report on the Colloquim on Recognition and Alleviation of Animal Pain and Distress. 191:1186-1189.

Arhart, D.K. 1972. Some factors that influence the response of European starlings to aversive visual stimuli. M.S. Thesis. Oregon State University Corvallis.

Avery, M.L., J.S. Humphrey, and D.G. Decker. 1997. Feeding deterrence of anthraquinone, anthracene, and anthrone to rice-eating birds. J. Wildl. Manage. 61(4):1359-1365.

Bailey, J. A. 1984. Principles of wildlife management. John Wiley and Sons, New York, New York. 373pp.

Barnes, T.G. 1991. Eastern bluebirds, nesting structure design and placement. College of Agric. Ext. Publ. FOR-52. Univ. of Kentucky, Lexington, KY, 4pp.

Beaver, B.V., W. Reed, S. Leary, B. McKiernan, F. Bain, R. Schultz, B.T. Bennett, P. Pascoe, E. Shull, L.C. Cork, R. Franis-Floyd, K.D. Amass, R. Johnson, R.H. Schmidt, W. Underwood, G.W. Thorton, and B.Kohn. 2001. 2000 Report of the AVMA Panel on Euthanasia. J. Am. Vet Med Assoc 218:669-696.

Belant, J. L., and S. K. Ickes. 1996. Overhead wires reduce roof-nesting by ring-billed gulls and herring gulls. Proc. Vertebr. Pest Conf. 17:108-112.

Bell, R. Q., and W.D. Klimstra. 1970. Feeding activities of Canada geese in southern Illinois. Trans. Of the IL State Acad. Of Science 63: 3. pp. 295-305

Besser, J.F., W. C. Royal, and J. W. DeGrazio. 1967. Baiting European starlings with DRC-1339 at a cattle feedlot. J. Wildl. Manage. 3:48-51.

_____ , J. W. DeGrazio, and J.L. Guarino. 1968. Costs of wintering European starlings and red-winged blackbirds at feedlots. Journal of Wildl. Manage. 32:179-180.

Blanton, E. M., B. U. Constantin, and G. L. Williams. 1992. Efficacy and methodology of urban pigeon control with DRC-1339. Proc. East. Wildl. Damage Cont. Conf. 5:58-62.

Blokpoel, H., and G.D. Tessier. 1984. Overhead wires and monofilament lines exclude ring-billed gulls from public places. Wildl. Soc. Bull. 12:55-58.

Bomford, M. 1990. Ineffectiveness of a sonic device for deterring European starlings. Wild. Soc. Bull. 18:(2):151-156.

Bookhout, T.A. and S.B. White. 1981. Blackbird and Starling roosting dynamics: implications for animal damage control. Proc. Bird Control Semin. 8:215-221.

Brown, L. E. 1999. State statisticians's note. *In* Kentucky Agricultural Statistics 1998-1999. USDA National Agri. Stat. and Kentucky Dep. Agri., P.O. Box 1120, Louisville, Kentucky 40201-1120. 162pp.

CDFG (California Department of Fish and Game). 1991. California department of fish and game. Final environmental document - bear hunting. Sections 265, 365, 366, 367, 367.5. Title 14 Calif. Code of Regs. Calif. Dept. of Fish and Game, State of California, April 25, 1991. 13pp.

Civil No. 92-C-0052A. January 1993. United States District Court of Utah, Civil No. 92-C-0052A, 1993.

Clark, L. 1997. Dermal contact repellents for European starlings: foot exposure to natural plant products. J. Wildl. Manage. 61(4): 1352-1358.

Clark, W. S. and B. K. Wheeler. 1987. The Peterson field guide series; a field guide to hawks of North America. Houghton Mifflin Co., Boston. 198pp.

Conover, M. R. 1982. Evaluation of behavioral techniques to reduce wildlife damage. Proc. Wildl.-Livestock Relation. Sym. 10:332-344.

Cunningham, D.J., E.W. Schafer, and L.K. McConnell. 1981. DRC-1339 and DRC-2698 residues in European starlings: preliminary evaluation of their effects on secondary hazard potential. Proc. Bird Control Semin. 8:31-37.

Davis, J.W., R.C. Anderson, L. Karstad, and D.O. Trainer. 1971. Infectious and Parasitic Diseases of Wild Birds. Iowa State University Press, Ames, Iowa.

Day, G. I., S. D. Schemnitz, and R. D. Taber. 1980. Capturing and marking wild animals. pp. 61-88 *in* Wildlife management techniques manual. S. D. Schemnitz ed. The Wildlife Society, Inc. Bethesda, MD. 686 pp.

Davidson, W.R. and V.F. Nettles. 1997. Field manual of wildlife diseases in the southeastern United States. 2nd. Ed. S.E. Coop. Wildl. Dis. Study, College Vet. Med., Univ. Of GA, Athens. 417pp.

Decino, T.J., D.J. Cunningham, and E.W. Schafer. 1966. Toxicity of DRC-1339 to European starlings. J. Wildl.\ Manage. 30(2):249-253.

DeHaven, R.W. and J.L. Guarino. 1969. A nest box trap for European starlings. Bird Banding 40:49-50.

Dolbeer, R.A., C.R. Ingram, and J.L. Seubert. 1976. Modeling as a management tool for assessing the impact of blackbird control measures. Proc. Vertebr. Pest Conf. 7:35-45.

_____ , and R. A. Stehn. 1979. Population trends of blackbirds and European starlings in North America, 1966-1976. U.S. Fish Wild. Serv. Spec. Sci. Rep. 214.

_____ . 1983. Population status of blackbirds and European starlings in North America, 1966-81. Proc. First Eastern Wildlife Damage Control Conf. Ithaca, New York.

_____ , P.P. Woronecki, and R.L. Bruggers. 1986. Reflecting tapes repel blackbirds from millet, sunflowers, and sweet corn. Wildl. Soc. Bull. 14:418-425.

_____ , M.A. Link, and P.P. Woronecki. 1988. Naphthalene shows no repellency for European starlings. Wildl. Soc. Bull. 16:62-64.

_____ , L. Clark, P.P. Woronecki, and T.W. Seamans. 1992. Pen tests of methyl anthranilate as a bird repellent in water. Proc. East. Wildl. Damage Control Conf. 5:112-116.

_____ , J.L. Belant, and L. Clark. 1993. Methyl anthranilate formulations to repel birds from water at airports and food at landfills. Proc. Great Plains Wildl. Damage Contr. Workshop. 11:42-52.

_____ , D.F. Mott, and J.L. Belant. 1995. Blackbirds and European starlings killed at winter roosts from PA-14 applications, 1974-1992: Implications for regional population management. Proc. East. Wildl. Damage Control Conf.

_____ , R. A. 1997. Feathered and furry fod - a serious problem at U. S. airports. Bird Strike Briefing, National Aerospace FOD Prevention Conf., 24-26 June 1997, Seattle WA. USDA / Wildl. Serv., National Wildl. Res. Ctr., Ohio Field Sta., 6100 Columbus Ave., Sandusky, OH 44870 USA.

_____ , T.W. Seamans, B.F. Blackwell, J.L. Belant. 1998. Anthraquinone formulation (Flight Control™) shows promise as avian feeding repellent. J. Wildl. Manage. 62(4)1558-1564.

Ehrlich, P. R.., D. S. Dobkin, and D. Wheye. 1988. The birder's handbook: a field guide to the natural history of North American birds. Simon & Schuster, Inc. New York. 785pp.

EPA (U.S. Environmental Protection Agency). 1980 (Sept.). Pesticide registration standard: 4-aminopyridine: avitrol. Office of Pesticides and Toxic Substances. Washington, DC.

_____ . 1995. R.E.D. Facts — Starlicide (3-chloro-p-toluidine hydrochloride). USEPA, Prevention, Pesticides and Toxic Substances. EPA-738-F-96-003. 4 p.

_____ . 1997. 4-Aminopyridine. Health Assessment Information. Taken from USEPA IRIS data file No. 504-24-5 (03/01/97) at Internet site http://www.epa.gov/ngispgm3/irisdat/0440.DAT

ETOXNET (Extension Toxicology Network). 1996. 4-Aminopyridine. Pesticide Information Profiles. Coop. Ext. Offices at Cornell Univ., OR State Univ., Univ. of ID, Univ. of CA-Davis, and the Instit. for Envir. Toxicology, MI State Univ. Information taken from Internet site http://ace.ace.orst.edu/info/extoxnet/pips/4-aminop.htm.

_____ . 2000. 4-Aminopyridine. Pesticide Information Profiles. Coop. Ext. Offices at Cornell Univ., OR State Univ., Univ. of ID, Univ. of CA-Davis, and the Instit. for Envir. Toxicology, MI State Univ. Information taken from Internet site http://pmep.cce.cornell.edu/profiles/ extoxnet/24d-captan/4aminopyridine-ext.html

Feare, C., A.J. Isaacson, P.A. Sheppard, and J.M. Hogan. 1981. Attempts to reduce starling damage at dairy farms. Protection Ecol. 3(2):173-181.

_____ . 1984. The Starling. Oxford University Press. Oxford New York.

Fitzwater, W. D. 1994. House Sparrows. pp. E101-108 *in* Prevention and control of wildlife damage. S. Hygnstrom, R. Timm, and G. Larson eds. Coop. Ext. Serv. Univ. of Nebr.-Lincoln.

Forbes, J.E. 1995. European starlings are expensive nuisance on dairy farms. Ag. Impact. 17(1):4.

Fuller-Perrine, L.D. and M.E. Tobin. 1993. A method for applying and removing bird exclusion netting in commercial vineyards. Wildl. Soc. Bull. 21:47-51.

Glahn, J.F. 1982. Use of starlicide to reduce starling damage at livestock feeding operations. Proc. Great Plains Wildl. Damage Control Workshop. 5:273-277.

_____ . 1983. Blackbird and starling depredations at Tennessee livestock farms. Proc. Bird Control Semin. 9:125-134.

_____ , and D.L. Otis. 1981. Approach for assessing feed loss damage by European starlings at livestock feedlots. ASTM Spec. Tech. Publ. No.752. p.38-45.

_____ , and D.L. Otis. 1986. Factors influencing blackbird and European starling damage at livestock feeding operations. J. Wildl. Manage. 50:15-19.

_____ , S.K. Timbrook, and D.J. Twedt. 1987. Temporal use patterns of wintering European starlings at a southeastern livestock farm: implications for damage control. Proc. East. Wildl. Damage Control Conf. 3:194-203.

_____ , and E. A. Wilson. 1992. Effectiveness of DRC-1339 baiting for reducing blackbird damage to sprouting rice. Proc. East. Wildl. Damage Cont. Conf. 5:117-123.

Grabill, B.A. 1977. Reducing starling use of wood duck boxes. Wildl. Soc. Bull. 5(2):67-70.

Graves, G. E., and W. F. Andelt. 1987. Prevention and control of woodpecker damage. Service in Action, Colo. St. Univ. Coop. Ex. Serv. Publ. no 6.516. Ft. Collins, Colo. 2 pp.

Heusmann, H.W., W.W. Blandin, and R.E. Turner. 1977. Starling deterrent nesting cylinders in wood duck management. Wildl. Soc. Bull. 5(1):14-18.

_____ , and R. Bellville. 1978. Effects of nest removal on starling populations. Wilson Bull. 90(2):287-290.

Hygnstrom, S. E., and S. R. Craven. 1994. Hawks and owls. pp. E53-62 *in* Prevention and control of wildlife damage. S. Hygnstrom, R. Timm, and G. Larson eds. Coop. Ext. Serv. Univ. of Nebr.-Lincoln

Ingold, D.J. 1994. Influence of nest site competition between European starlings and woodpeckers. Wilson Bull 1106(2):227-241.

Johnson, R.J., and J.F. Glahn. 1994. European starlings. p. E-109 - E-120 in Hygnstrom, S.E., R.M. Timm, and G.E. Larson, Prevention and control of wildlife damage - 1994. Univ. NE Coop. Ext., Instit. o f Ag. and Nat. Res., Univ. of NE-Lincoln, USDA, APHIS, ADC, Great Plains Ag. Council Wildl. Committee.

Kentucky Epidemiological Notes & Reports. 1992. Fungal diseases. Cabinet For Human Resour., Dep. For Health Serv., Div. Of Epidem. 27(10):1-2.

Kentucky Agricultural Statistics Service. 1999. Kentucky agricultural statistics 1998-1999. USDA National Agri. Stat. and Kentucky Dep. Agri., P.O. Box 1120, Louisville, Kentucky 40201-1120. 162pp.

Kerpez, T.A. and N.S. Smith. 1990. Competition between European starlings and native woodpeckers for nest cavities in saguaros. Auk. 107:367-375.

Klingel, J. 1997. Kentucky Species List -- Species Accounts. Biota Information System of Kentucky (BISON-M), Version 9/97. Kentucky Dept. of Game and Fish (Information retrieved from Internet site http://www.fw.vt.edu/fishex/states/nm.htm).

Knittle, C.E. and J.L. Guarino. 1976. Reducing a local population of European starlings with nest-box traps. Proc. Bird Control. Semin. 7:65-66.

Larsen, K. H., and J. H. Dietrich. 1970. Reduction of a raven population on lambing grounds with DRC-1339. J. Wildl. Manage. 34:200-204.

Mason, J.R., R.E. Stebbings and G.P. Winn. 1972. Noctules and European starlings competing for roosting holes. J. Zool. 166:467.

_____ , A. H. Arzt, and R.F. Reidinger. 1984. Evaluation of dimethylanthranilate as a nontoxic starling repellent for feedlot settings. Proc. East. Wildl. Damage Control Conf. 1:259-263.

_____ , M.A. Adams, and L. Clark. 1989. Anthranilate repellency to European starlings: chemical correlates and sensory perception. J. Wildl. Manage. 53:55-64.

_____ , and L. Clark. 1992. Nonlethal repellents: the development of cost-effective, practical solutions to agricultural and industrial problems. Proc. Vertebr. Pest Conf. 15:115-129.

McCracken H.F. 1972. Starling control in Sonoma County. Proc. Vertebr. Pest Conf. 5:124-126.

Meanley, B. and W. C. Royall. 1976. Nationwide estimates of blackbirds and European starlings. Proc. Bird Control Seminar. 7:39-40.

Miller, J.W. 1975. Much ado about European starlings. Nat. Hist. 84(7):38-45

Mott. D.F. 1985. Dispersing blackbird-starling roosts with helium-filled balloons. Proc. East. Wildl. Damage Conf. 2:156-162.

National Audubon Society. 2000. Field guide to birds eastern region North America. 2nd ed., 9th printing, J. Bull. Jr. and J. Farrand, Jr. *eds*. Alfred A. Knopf, Inc., Chanticleer Press, Inc., New York. 796pp.

Nickell, W.P. 1967. European starlings and sparrow hawks occupy same nest box. Jack-Pine Warbler 45:55

NTSB (National Transportation Safety Board). 1999. Safety Recommendation to the Federal Aviation Administration, Washington, D.C. 20591. A-99-86 through -94.

Pfeifer, W. K. 1983. Waterfowl damage prevention and control methods In Prevention And Control Of Wildlife Damage. Great Plains Agri. Council Wildl. Resour. Committee, Coop. Ext. Serv., Inst. of Agri. And Nat. Resour. Univ. Of Nebr. - Lincoln. pp. E-75-78.

Pochop, P.A. 1998. Comparison of white mineral oil and corn oil to reduce hatchability of ring-billed gull eggs. Proc. Vertebr. Pest Conf. 18:411-413.

_____ , J.L. Cummings, J.E. Steuber, and C.A. Yoder. 1998. Effectiveness of several oils to reduce hatchability of chicken eggs. J. Wildl. Manage. 62(1):395-398.

Robbins, C. S. 1973. Introduction, spread, and present abundance of the house sparrow in North America. Ornithol. Monogr. 14:3-9.

_____ , C. S., B. Bruun, and H. S. Zim. 1983. A guide to field identification birds of North America. Golden books publ. Co., Inc., Racine, Wisconsin. 360pp.

Rossbach, R. 1975. Further experiences with the electroacoustic method of driving European starlings from their sleeping areas. Emberiza 2(3):176-179.

Royall, W. C. 1977. Blackbird-Starling Roost Survey. Bird Damage Research Report #52. Denver Wildlife Research Center. 54pp.

_____ , T.J. DeCino, and J.F. Besser. 1967. Reduction of a Starling Population at a Turkey Farm. Poultry Science. Vol. XLVI No. 6. pp 1494-1495.

Salmon, T. P., and F. S. Conte. 1981. Control of bird damage at aquaculture facilities. USDI, U. S. Fish and Wildl. Serv. Wildl. Lflt. No. 475. llpp.

Sanderson, Glen C., and Frank C. Bellrose. 1986. A review of the problem of lead poisoning in waterfowl. Illinois Natural History Survey, Champaign, IL. Spec. Publ. 4. Jamestown ND: Northern Prairie Wildl. Res. Ctr. Home Page. Http://www.npwrc.usgs.gov/resource/othrdata/pbpoison/pbpoison.htm (Version 170CT97). 34pp.

Sauer, J. R., S. Schwartz, and B. Hoover. 1996. The Christmas bird count home page. Version 95.1. Patuxent Wildlife Research Center, Laurel, MD (Info. retreived from http://www.mbr-pwrc.usgs.gov/bbs/cbc.html).

_____ , J. E. Hines, G. Gough, I. Thomas, and B. G. Peterjohn. 1999. The North American Breeding Bird Survey Results and Analysis. Version 98.1. Patuxent Wildlife Research Center, Laurel, MD (Information retrieved from Internet World-wide Web http://www.mbr-pwrc.usgs.gov/bbs/bbs.html).

Schaeffer, L. 1992. Avian predators at ODFW hatcheries: their identification and control. Oregon Dep. Fish and Wildl., Information Rpt. 92-1. 19pp.

Schafer, E. W. 1991. "Bird control chemicals-nature, mode of action and toxicity." pp. 599-610 *in* CRC Handbook of Pest Management in Agriculture Vol. II. CRC Press, Cleveland, OH.

Schafer, E. W. Jr., R. B. Brunton, and N. F. Lockyer. 1974. Hazards to animals feeding on blackbirds killed with 4-aminopyrine baits. J. Wildl. Manage. 38:424-426.

Schmidt, R. 1989. Wildlife management and animal welfare. Trans. N.Amer. Wildl. And Nat. Res. Conf. 54:468-475.

Schmidt, R.H. and R.J. Johnson. 1984. Bird dispersal recordings: an overview. ASTM STP 817. 4:43-65.

Shake, W.F. 1967. Starling wood duck interrelationships. M.S. Thesis. Western Illinois University, Macomb.

Shirota, Y.M. and S. Masake. 1983. Eyespotted balloons are a device to scare gray European starlings. Appl. Ent. Zool. 18:545-549.

Slate, D.A., R. Owens, G. Connolly, and G. Simmons. 1992. Decision making for wildlife damage management. Trans. N. A. Wildl. Nat. Res. Conf 57:51-62.

Stickley, A.R. and R.J. Weeks. 1985. Histoplasmosis and its impact on blackbird/starling roost management. Proc. East. Wildl. Damage Control. Conf. 2:163-171.

Terres, J.K. 1980. The Audubon Society Encyclopedia of North American Birds. Wings Bros. New York, New York.

Twedt, D.J., and J.F. Glahn. 1982. Reducing starling depredations at livestock feeding operations through changes in management practices. Proc. Vertebr. Pest Conf. 10:159-163.

Twedt, D.J., and J.F. Glahn. 1984. Livestock feed sizes for reducing starling depredations at feedlots in Kentucky, U.S.A. Prot. Ecol. 6(3):233-239.

USDA (U.S. Department of Agriculture), Animal and Plant Health Inspection Service (APHIS), Animal Damage Control (ADC) Strategic Plan. 1989. USDA, APHIS, ADC Operational Support Staff, 4700 River Road, Unit 87, Riverdale, MD 20737.

_____ , (APHIS) Animal and Plant Health Inspection Service, (ADC) Animal Damage Control Program. 1997 (revised). Final Environmental Impact Statement. USDA, APHIS, ADC Operational Support Staff, 4700 River Road, Unit 87, Riverdale, MD 20737.

[redacted]

_____ , (APHIS) Animal and Plant Health Inspection Service, (ADC) Animal Damage Control Program. 1997. Environmental assessment (EA) -- Management of property damage and hazards to public health and safety caused by pigeons in the state of Kentucky. USDA, APHIS, WS Louisville, Kentucky District Office, 3231 Ruckriegel Parkway, Suite 107, Louisville, KY 40299. 13 pp.

_____ ,(APHIS) Animal and Plant Health Inspection Service, (WS) Wildlife Services Program. 1998. Environmental Assessment -- Bird damage management in the Idaho Wildlife Services program. USDA, APHIS, WS Idaho State Office, 1828 Airport Way, Boise, Idaho 83705. 53 pp.

USDI-USFWS-USDC (U.S. Department of the Interior-U.S. Fish and Wildlife Service-U.S. Department of Commerce, Bureau of the Census. 1996 National survey of fishing, hunting, and wildlife-associated recreation.

U. S. Environmental Hygiene Agency. 1992. Managing health hazards associated with bird and bat excrement. TG No. 142. 18pp.

USFWS (U. S. Fish & Wildlife Service). 2000. Red-cockaded woodpecker *Picoides* (=*Dendrocopos*) *borealis*. *In* U. S. Fish and Wildl. Serv. Div. Of Endangered Species Accounts: Endangered and threatened species of the southeastern United States (The Red Book) FWS Region 4 — As of 8/93.

USDI (U. S. Dept. Of The Interior). 1998. 50 CFR Part 21. RIN 1018-AE11. Migratory bird permits; establishment of a depredation order for the double-crested cormorant. Agency: Fish and Wildl. Serv., Int. Action: Final Rule. Federal Register / Vol. 63, No. 42 / Wednesday, March 4, 1998 / Rules and Regulations.

USDOT (U.S. Dept. Of Transportation), FAA (Federal Aviation Administration). 1997. Advisory circular No. 150/5200-33. subject: hazardous wildlife attractants on or near airports. 10pp.

_____ . 1998. Wildlife strikes to civil aircraft in the United States 1991-1997. Federal Aviation Admin. Wildl. Aircraft Strike Database, Ser. Rpt No.4. Sept, 1998.

Vogt, P.F. 1997. Control of nuisance birds by fogging with REJEX-IT®TP-40. Proc. Great Plains Wildl. Damage Contr. Workshop 13. p. 63-66.

Von Jarchow, B.L. 1943. European starlings frustrate sparrow hawks in nesting attempt. Passenger Pigeon. 5(2):51.

Weber, W.J. 1979. Health Hazards from Pigeons, European starlings, and English Sparrows. Thompson Publ. Fresno, Calif. 138 p.

Weeks, R. J., and Stickley, A. R. 1984. Histoplasmosis and its relation to bird roosts: a review. Denver Wildl. Res. Ctr. Bird Damage Rpt. No. 330. U.S. Fish and Wildl. Serv. 23pp.

Weitzel, N.H. 1988. Nest site competition between the European starling and native breeding birds in northwestern Nevada. Condor. 90(2):515-517.

West, R.R., J.F. Besser and J.W. DeGrazio. 1967. Starling control in livestock feeding areas. Proc. Vertebr. Pest Conf. San Francisco, CA.

_____ , and J.F. Besser. 1976. Selection of toxic poultry pellets from cattle rations by European starlings. Proc. Bird Control Semin. 7:242-244.

Williams, D.E. and R.M. Corrigan. 1994. Pigeons (Rock Doves) p. E-87 - E-96 in Hygnstrom, S.E., R.M. Timm, and G.E. Larson, Prevention and control of wildlife damage - 1994. Univ. NE Coop. Ext., Instit. o f Ag. and Nat. Res., Univ. of NE-Lincoln, USDA, APHIS, ADC, Great Plains Ag. Council Wildl. Committee.

Williams, R. E. 1983. Integrated management of wintering blackbirds and their economic impact at south Texas feedlots. Ph.D. Dissertation, Tex. A&M Univ., College Station. 282 pp.

Wilmer, T.J. 1987. Competition between European starlings and kestrels for nest boxes: a review. Raptor Res. Rep. No. 6 p. 156-159.

Woronecki, P. P., R. A. Dolbeer, and T. W. Seamans. 1990. Use of alpha-chloralose to remove waterfowl from nuisance and damage situations. Proc. Vertbr. Pest Conf. 14:343-349.

Wright, E.N. 1973. Experiments to control starling damage at intensive animal husbandry units. Bull. OEPP. 9:85-89.

APPENDIX B

BIRD DAMAGE MANAGEMENT (BDM) METHODS AVAILABLE FOR USE OR RECOMMENDATION BY THE TENNESSEE WILDLIFE SERVICES PROGRAM

NONLETHAL METHODS - NONCHEMICAL

Agricultural producer and property owner practices. These consist primarily of nonlethal preventive methods such as cultural methods and habitat modification. Cultural methods and other management techniques are implemented by the agricultural producer or property owners/managers. Resource owners/managers may be encouraged to use these methods, based on the level of risk, need, and professional judgement on their effectiveness and practicality. These methods include:

Cultural methods. These may include altering planting dates so that crops are not young and more vulnerable to damage when the damage-causing species is present, or the planting of crops that are less attractive or less vulnerable to such species (e.g., wintering geese). At feedlots or dairies, cultural methods generally involve modifications to the level of care or attention given to livestock which may vary depending on the age and size of the livestock. Animal husbandry practices include but are not limited to techniques such as night feeding, indoor feeding, closed barns or corrals, removal of spilled grain or standing water, and use of bird proof feeders (Johnson and Glahn 1994). Increased feed size may reduce consumption by European starlings but may not be cost effective for the producer (Twedt and Glahn 1984).

Environmental/Habitat modification can be an integral part of BDM. Wildlife production and/or presence is directly related to the type, quality, and quantity of suitable habitat. Therefore, habitat can be managed to reduce or eliminate the production or attraction of certain bird species or to repel certain birds. In most cases, the resource or property owner is responsible for implementing habitat modifications, and WS only provides advice on the type of modifications that have the best chance of achieving the desired effect. Habitat management is most often a primary component of BDM strategies at or near airports to reduce bird aircraft strike problems by eliminating bird nesting, roosting, loafing, or feeding sites. Generally, many bird problems on airport properties can be minimized through management of vegetation and water from areas adjacent to aircraft runways. Habitat management is often necessary to minimize damage caused by blackbirds and European starlings that form large roosts during late summer, autumn and winter. Bird activity 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 sometimes the only way to permanently stop such activity at a site (USDA 1997).

Animal behavior modification. This refers to tactics that alter the behavior of wildlife to reduce damage. Animal behavior modification may involve use of scare tactics or fencing to deter or repel animals that cause loss or damage (Twedt and Glahn 1982). Some but not all methods that are included in this category are:

- Bird-proof barriers
- Electronic guards
- Propane exploders
- Pyrotechnics
- Distress calls and sound producing devices
- Chemical frightening agents
- Repellents
- Scare crows
- Mylar tape
- Eye-spot balloons
- Harassment with a hovercraft

- Harassment with trained dogs

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 (Arhart 1972, Rossbach 1975, Conover 1982, Shirota et al. 1983, Schmidt and Johnson 1984, Mott 1985, Graves and Andelt 1987, and Bomford 1990). Mylar tape has produced mixed results in its effectiveness to frighten birds (Dolbeer et al. 1986, Tobin et al. 1988).

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). Heavy plastic strips hung vertically in open doorways 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.

Monofilament wires can effectively deter gull use of specific areas where they are causing a nuisance (Blokpoel 1976; 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.

Porcupine wire (e.g., Nixalite™, 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).

Auditory scaring devices such as propane exploders, pyrotechnics, electronic guards, scare crows, and audio distress/predator vocalizations are effective in many situations for dispersing damage-causing bird species. These devices are sometimes effective but usually only for a short period of time before birds become accustomed and learn to ignore them (Arhart 1972, Rossbach 1975, Shirota et.al. 1983, Schmidt and Johnson 1984, Mott 1985, and Bomford 1990). Williams (1983) reported an approximate 50% reduction in blackbirds at two south Texas feedlots as a result of pyrotechnics and propane cannon use. However, they are often not practical in dairy or feedlot situations because of the disturbance to livestock, although livestock can generally be expected to habituate to the noise. Birds, too, quickly learn to ignore scaring devices if the birds' fear of the methods is not reinforced with shooting or other tactics.

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.

Relocation of damaging birds to other areas following live capture generally would not be effective nor 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. Translocation 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 are exceptions to the rule for relocating birds. Relocation of damaging birds might be a viable solution and acceptable to the public when the birds were considered to have high value such as migratory waterfowl, raptors, or T&E species. In these cases, WS would consult with the USFWS and/or TWRA to coordinate capture, transportation, and selection of suitable relocation sites.

Nest destruction is the removal of nesting materials during the construction phase of the nesting cycle. Nest destruction is generally only applied when dealing with a single bird or very few birds. This method is used to discourage birds from constructing nests in areas which may create nuisances for home and business owners. Heusmann and Bellville (1978) reported that nest removal was an effective but time-consuming method because problem bird species are highly mobile and can easily return to damage sites from long distances, or because of high populations. This method poses no imminent danger to pets or the public.

Live traps include:

Clover, funnel, and common pigeon traps are enclosure traps made of nylon netting or hardware cloth and come in many different sizes and designs, depending on the species of birds being captured. The entrance of the traps also vary greatly from swinging-door, one-way door, funnel entrance, to tip-top sliding doors. Traps are baited with grains or other food material which attract the target birds. WS' standard procedure when conducting pigeon 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.

Decoy traps are used by WS for preventive and corrective damage management. Decoy traps are similar in design to the Australian Crow Trap as reported by Johnson and Glahn (1994) and McCracken (1972). Live decoy birds of the same species that are being targeted are usually placed in the trap with sufficient food and water to assure their survival. Perches are configured in the trap to allow birds to roost above the ground and in a more natural position. Feeding behavior and calls of the decoy birds attract other birds which enter and become trapped themselves. Active decoy traps are monitored daily, every other day, or as appropriate, to remove and euthanize excess birds and to replenish bait and water. Decoy traps and other cage/live traps, as applied and used by WS, pose no danger to pets or the public and if a pet is accidentally captured in such traps, it can be released unharmed.

Nest box traps may be used by WS for corrective damage management and are effective in capturing local breeding and post breeding European starlings and other targeted secondary cavity nesting birds (DeHaven and Guarino 1969, Knittle and Guarino 1976). Nest box traps are effective in capturing local breeding and post breeding European starlings in limited areas (DeHaven and Guarino 1969; Knittle and Guarino 1976). Trapped birds are euthanized. 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. Translocation 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.

Mist nets are more commonly used for capturing small-sized birds such as English sparrows, finches, etc. but can be used to capture larger birds such as ducks and ring-neck pheasants or even smaller nuisance hawks and owls. It was introduced in to the United States in the 1950's from Asia and the Mediterranean where it was used to capture birds for the market (Day et al. 1980). The mist net is a fine black silk or nylon net usually 3 to 10 feet wide and 25 to 35 feet long. 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.

Cannon nets are normally used for larger birds such as pigeons, feral ducks, and waterfowl and use mortar projectiles to propel a net up and over birds which have been baited to a particular site. This type of net is especially effective for waterfowl that are flightless due to molting and other birds which are typically shy to other types of capture.

Bal-chatri traps are small traps used for capturing birds of prey such as hawks and eagles. Live bait such as pigeons, European starlings, rodents, etc. are used to lure raptors into landing on the trap (Hygnstrom and Craven 1994) where nylon nooses entangle their feet and hold the bird. The trap is made of chicken wire or other wire mesh material which is formed into a Quonset hut-shaped cage that holds the live bait. The outside top and sides are covered with many nooses consisting of strong monofilament line or stiff nylon string.

Lure crops/alternate foods. When depredations cannot be avoided by careful crop selection or modified planting schedules, lure crops can sometimes be used to mitigate the loss potential. Lure crops are planted or left for consumption by wildlife as an alternative food source. 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. This method is part of the integrated BDM strategy for reducing crop damage by sandhill cranes and geese in some WS State programs ([redacted], WS Pers. Comm., 2000).

NONLETHAL METHODS - CHEMICAL

Mesurol (**Methiocarb** or 4-methylthio-3,5-xylyl N-nethylcarbamate) is a 75% wettable powder aversive conditioning chemical is used for egg treatment to reduce predation on the eggs of protected, threatened or endangered species. It is a restricted use pesticide which is acutely toxic to birds, fish and aquatic invertebrates. Formulations used by WS for protection of eggs of species of concern are somewhat toxic to animals which feed upon them. Animals are made ill from food materials treated with methiocarb and tend to avoid feeding on items similar in appearance. By presenting treated eggs in locations at or near where species to be protected nest, it may be possible to condition corvid (crows and magpies) predators to avoid feeding on similar looking eggs located in the same area. Such avoidance responses may be acquired over a period of time and may require repeated exposures in order to be maintained. Occasionally, birds may die after feeding upon treated eggs, but most birds exposed to treated eggs survive. Methiocarb is injected into the treated egg with a hypodermic needle and the egg is sealed. Eggs are marked as poison and EPA label specifications (Appendix E)for use of treated eggs provide for mitigation practices and procedures to protect non-target animals of concern from feeding on them. Methiocarb is approved for use only by APHIS Certified Applicators or persons under their direct supervision.

Methyl and di-methyl anthranilate (artificial grape flavoring used in foods and soft drinks for human consumption) could be used or recommended by WS as a bird repellent. Methyl and di-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). MA is also under investigation as a potential bird taste repellent. MA may become available for use as a livestock feed additive (Mason et.al. 1984; 1989). It is registered 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[4]), nontoxic to rats in an inhalation study (LC_{50} > 2.8 mg/L[5]), and of relatively low toxicity to fish and other invertebrates. MA is naturally occurring in concord grapes and in the blossoms of several species of flowers and is used as a food additive and perfume ingredient (Dolbeer et al. 1992; RJ Advantage, Inc. 1997). It has been listed as "Generally Recognized as Safe" (GRAS) 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 (RJ Advantage, Inc. 1997). An example of the level of expense involved is a golf course in Rio Rancho, NM where it was estimated that treating four watercourse areas would cost in excess of $25,000 per treatment for material alone. Cost of treating turf areas would be similar on a per acre basis. Also, MA completely degrades in about 3 days when applied to water (RJ Advantage, Inc. 1997) which indicates the repellent effect is short-lived.

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 (Dr. P. Vogt, RJ Advantage, Inc., pers. comm. 1997). 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.

MA is also being investigated as a livestock feed additive to reduce or prevent feed consumption by birds. Such chemicals undergo rigorous testing and research to prove safety, effectiveness, and low environmental risks before they would be registered by U.S. Environmental Protection Agency (EPA) or the Food and Drug Administration (FDA).

Particulate feed additives have been investigated for their bird-repellent characteristics. In pen trials, European starlings rejected grain to which charcoal particles were adhered (L. Clark, NWRC, Pers. Comm. 1999). If further research finds this method to be effective and economical in field application, it might become available as a bird repellent on livestock feed. Charcoal feed additives have been explored for use in reducing methane production in livestock and should have no adverse effects on livestock, on meat or milk production, or on human consumers of meat or dairy products (L. Clark, NWRC, pers. comm. 1999).

Other chemical repellents. A number of other chemicals have shown bird repellent capabilities. Anthraquinone, a naturally occurring chemical found in many plant species and in some invertebrates as a natural predator defense mechanism, has shown effectiveness in protecting rice seed from red-winged

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[4]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.

[5]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.

blackbirds and boat-tailed grackles (Avery et al. 1997). It has also shown effectiveness as a foraging repellent against Canada goose grazing on turf and as a seed repellent against brown-headed cowbirds (Dolbeer et al. 1998). Compounds extracted from common spices used in cooking and applied to perches in cage tests have been shown repellent characteristics against roosting European starlings (Clark 1997). Naphthalene (moth balls) was found to be ineffective in repelling European starlings (Dolbeer et al. 1988).

Tactile repellents. A number of tactile repellent products are on the market which reportedly deter birds from roosting on certain structural surfaces by presenting a tacky or sticky surface that the birds avoid. However, experimental data in support of this claim are sparse (Mason and Clark 1992). The repellency of tractile products is generally short-lived because of dust, and they sometimes cause aesthetic problems and expensive clean-up costs by running down the sides of buildings in hot weather.

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Avitrol is a chemical frightening agent (repellent) that is effective in a single dose when mixed with untreated baits, normally in a 1:9 ratio. Avitrol, however, is not completely nonlethal in that a small portion of the birds are generally killed (Johnson and Glahn 1994). Prebaiting is usually necessary to achieve effective bait acceptance by the target species. This chemical is registered for use on pigeons, crows, gulls, blackbirds, European starlings, and English sparrows in various situations. Avitrol treated bait is placed in an area where the targeted birds are feeding and usually a few birds will consume a treated bait and become affected by the chemical. The affected birds then broadcast distress vocalizations and display abnormal flying behavior, thereby frightening the remaining flock away.

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. 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 availability for intake by organisms from water, is nonaccumulative in tissues and 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 appear 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 Lethal Dose (LD_{50}) in contaminated prey for 20 days were not adversely affected and three American kestrels that were fed contaminated blackbirds for seven to 45 days were not adversely affected. A formal Risk Assessment found 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 (USDA 1997, Appendix P).

Avitrol use in the TN WS program has been extremely limited and discussion of this use is provided in Subsections 5.1.3.1 and 5.2.1.1.

Alpha-chloralose is a central nervous system depressant used as an immobilizing agent to capture and remove nuisance waterfowl and other birds. It is labor intensive and in some cases, may not be cost effective (Wright 1973, Feare et al. 1981), but is typically used in recreational and residential areas, such as swimming pools, shoreline residential areas, golf courses, or resorts. Alpha-chloralose is typically delivered as a well contained bait in small quantities with minimal hazards to pets and humans; single bread or corn

baits are fed directly to the target birds. WS personnel are present at the site of application during baiting to retrieve the immobilized birds. Unconsumed baits are removed from the site following each treatment. Alpha-chloralose 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. Alpha-chloralose 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 two to 30 times lower than the LD_{50}. Mammalian data indicate higher LD_{50} values than birds. Toxicity to aquatic organisms is unknown (Woronecki et al. 1990) but the compound is not generally soluble in water and therefore should remain unavailable to aquatic organisms. Factors supporting the determination of this low potential included the lack of exposure to pets, nontarget species and the public, and the low toxicity of the active ingredient. Other supporting rationale for this determination included relatively low total annual use and a limited number of potential exposure pathways. The agent is currently approved for use by WS as an Investigative New Animal Drug by the FDA rather than a pesticide.

LETHAL METHODS - MECHANICAL

Egg addling/destruction is a method of suppressing reproduction in local nuisance bird populations by destroying egg embryos 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 destruction can be accomplished in several different ways, but the most commonly used methods are manually gathering eggs and breaking them, or by oiling or spraying the eggs with a liquid which covers the entire egg and prevents the egg from obtaining oxygen (see *Egg oiling* below). Although WS does not commonly use egg addling or destruction, it is a valuable damage management tool and has proven effective in some applications.

Shooting is more effective as a dispersal technique than as a way to reduce bird densities when large number of birds are present. Normally shooting is conducted with shotguns or air rifles. Shooting is a very individual specific method and is normally used to remove a single offending bird, or group of birds numbering less than 50 at one location. However, at times, a few birds could be shot from a flock to make the remainder of the birds more wary and to help reinforce nonlethal methods. Shooting can be relatively expensive because of the staff hours sometimes required (USDA 1997). It is selective for target species and may be used in conjunction with the use of spotlights, decoys, and calling. Shooting with shotguns, air rifles, or rim and center fire rifles is sometimes used to manage bird damage problems when lethal methods are determined to be appropriate. The birds are killed as quickly and humanely as possible. All firearm safety precautions are followed by WS when conducting BDM activities and all laws and regulations governing the lawful use of firearms are strictly complied with.

Firearm use is very sensitive and a public concern because of safety issues relating to the public and misuse. To ensure safe use and awareness, WS employees who use firearms to conduct official duties are required to attend an approved firearms safety and use training program within 3 months of their appointment and a refresher course every 3 years afterwards (WS Directive 2.615). WS employees who carry firearms as a condition of employment, are required to sign a form certifying that they meet the criteria as stated in the *Lautenberg Amendment* which prohibits firearm possession by anyone who has been convicted of a misdemeanor crime of domestic violence.

Sport hunting is sometimes recommended by WS as a viable damage management method when the target species can be legally hunted. A valid hunting license and other licenses or permits may be required by the TWRA 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, dairies, airports, and other facilities. It is occasionally used for managing damage caused by European starlings, English sparrows, Canada geese, and other waterfowl.

Snap traps are modified rat snap traps used to remove individual woodpeckers, European starlings, and other cavity using birds. The trap treadle is baited with peanut butter or other food attractants and attached near the damage area caused by the offending bird. These traps pose no imminent danger to pets or the public, and are usually located in positions inaccessible to people and most non-avian animals. They are very selective because they are usually set in the defended territory of the target birds.

LETHAL METHODS - CHEMICAL

All chemicals used by WS are registered as required by the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) (administered by the EPA and TDA) or by the FDA. WS personnel that use restricted-use chemical methods are certified as pesticide applicators by TDA and are required to adhere to all certification requirements set forth in FIFRA and Tennessee pesticide control laws and regulations. Chemicals are only used on private, public, or tribal property sites with authorization from the property owner/manager.

CO2 is sometimes used to euthanize birds which are captured in live traps and when relocation is not a feasible option. Live birds are placed in a container such as a plastic 5-gallon bucket or chamber and sealed shut. CO2 gas is released into the bucket or chamber and birds quickly die after inhaling the gas. This method is approved as a euthanizing agent by the American Veterinary Medical Association. CO_2 gas is a byproduct of animal respiration, is common in the atmosphere, and is required by plants for photosynthesis. It is used to carbonate beverages for human consumption and is also the gas released by dry ice. The use of CO_2 by WS for euthanasia purposes is exceedingly minor and inconsequential to the amounts used for other purposes by the public.

Egg oiling is a method for suppressing reproduction of nuisance birds by spraying a small quantity of food grade vegetable oil or mineral oil on eggs in nests. The oil prevents exchange of gases and causes asphyxiation of developing embryos and has been found to be 96-100% effective in reducing hatchability. (Pochop 1998; Pochop et al. 1998). The method has an advantage over nest or egg destruction in that the incubating birds generally continue incubation and do not renest. The EPA has ruled that use of corn oil for this purpose is exempt from registration requirements under FIFRA. To be most effective, the oil should be applied anytime between the fifth day after the laying of the last egg in a nest and at least five days before anticipated hatching. This method is extremely target specific and is less labor intensive than egg addling.

DRC-1339 is the principal chemical method that would be used for starling/blackbird and pigeon damage management in the proposed action. For more than 30 years, DRC-1339 has proven to be an effective method of starling, blackbird, gull, and pigeon control at feedlots, dairies, airports, and in urban areas (West et al. 1967, Besser et al. 1967, Decino et al. 1966). Studies continue to document the effectiveness of DRC-1339 in resolving blackbird / starling problems at feedlots (West and Besser 1976, Glahn 1982, Glahn et al. 1987), and Blanton et al. (1992) reports that DRC-1339 appears to be a very effective, selective, and safe means of urban pigeon population reduction. Glahn and Wilson (1992) noted that baiting with DRC-1339 is a cost-effective method of reducing damage by blackbirds to sprouting rice. DRC-1339 is a slow acting avicide that is registered with the EPA for reducing damage from several species of birds, including blackbirds, European starlings, pigeons, crows, ravens, magpies, and gulls. DRC-1339 was developed as an avicide because of its differential toxicity to mammals. DRC-1339 is highly toxic to sensitive species but only slightly toxic to nonsensitive birds, predatory birds, and mammals. For example, European starlings, a highly sensitive species, require a dose of only 0.3 mg/bird to cause death (Royall et al. 1967). Most bird

species that are responsible for damage, including European starlings, blackbirds, pigeons, crows, magpies, and ravens are highly sensitive to DRC-1339. Many other bird species such as raptors, sparrows, and eagles are classified as nonsensitive. Numerous studies show that DRC-1339 poses minimal risk of primary poisoning to nontarget 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. 1981). This can be attributed to relatively low toxicity to species that might scavenge on blackbirds and European starlings killed by DRC-1339 and its tendency to be almost completely metabolized in the target birds which leaves little residue to be ingested by scavengers. Secondary hazards of DRC-1339 are almost nonexistent. DRC-1339 acts in a humane manner producing a quiet and apparently painless death. DRC-1339 is unstable in the environment and degrades rapidly when exposed to sunlight, heat, or ultraviolet 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). Appendix P of USDA (1997) contains a thorough risk assessment of DRC-1339 and the reader is referred to that source for a more complete discussion. That assessment concluded that no adverse effects are expected from use of DRC-1339.

DRC 1339 has several EPA Registration Labels (56228-10, 56228-17, 56228-28, 56228-29, and 56228-30) depending on the application or species involved in the BDM project. Tennessee WS used a total of 822 grams (1.8pounds) of DRC-1339 for the past 3 years (Table C-1). The chemical was applied on both public and private lands for reduction of damage by pigeons (57.54%), and blackbirds/European starlings (42.46%). (USDA-WS MIS Database).

Table B-1. DRC-1339 Used by Tennessee WS During Three Concurrent Fiscal Years.

FY	EPA Reg.	Species	Quantity Used
2001	56228-10	Blackbirds/ European starlings	91 g
	56228-28	Pigeons	197 g
	602-136	European starlings	99 g
2000	56228-10	Blackbirds/ European starlings	159 g
	56228-28	Pigeons	111 g
1999	56228-28	Pigeons	165 g

APPENDIX C

PERMITS FOR WS BDM PROGRAMS IN TENNESSEE

APPENDIX D

MEMORANDA OF UNDERSTANDING AMONG ENTITIES COLLABORATING WITH WILDLIFE SERVICES IN THE BDM PROGRAM IN TENNESSEE

APPENDIX E

MATERIAL SAFETY DATA SHEETS AND PESTICIDE LABELS FOR PESTICIDES USED IN THE TENNESSEE WILDLIFE SERVICES BDM PROGRAM