

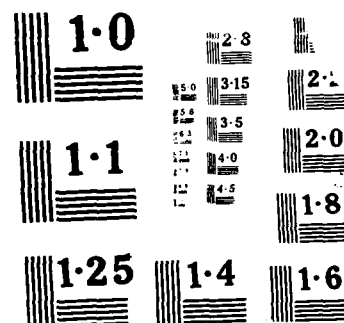
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TECHNICAL REPORT REMR-EM-2

**EVALUATION OF BIRD PEST PROBLEMS
AT U.S. ARMY CORPS OF ENGINEERS
CIVIL WORKS PROJECTS**

by

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Construction Engineering Research Laboratory

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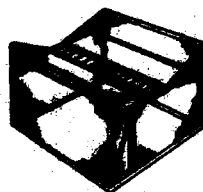
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COVER FIGURES:

- FIRST** — Plastic bird netting
- SECOND** — Nest box trap for starlings or house sparrows
- THIRD** — Australian crow trap
- FOURTH** — Porcupine wire

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06	03		Birds Pest Control Structures		
19 ABSTRACT (Continue on reverse if necessary and identify by block number) A questionnaire was designed and distributed nationwide to U.S. Army Corps of Engineers Civil Works projects to evaluate the nature and magnitude of bird damage and nuisance bird pests. Two hundred sixty-seven individual projects or management offices responded to the questionnaire. Fifty-eight of these projects/offices reported that they had no significant problems with birds. The 209 projects/offices with bird pests identified a combined total of 783 individual pest problems or bird damage. On the basis of a detailed analysis of questionnaire responses, 29 projects, representing 16 nationwide Corps of Engineer (Cont'd)					
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Rehabilitation (REMR) Research Program. This report is available from the National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161.

BLOCK 19 (Cont'd)

Districts, were identified as having the severest, as well as most representative, Civil Works bird problems. These Districts and projects were contacted by telephone to further assess their individual problems.

Bird damage control authorities were consulted to establish additional contacts with the projects. The consensus ~~of these experts~~ was that most Civil Works bird problems could be controlled with existing established pest management techniques.

The most severe and widespread problem noted during the study was pigeons roosting or nesting on structures such as lock and dam complexes, bridges, and power generating stations. Gulls, swallows, and a few other species were responsible for similar localized problems, usually on a smaller scale. The chief complaint was bird excrement, which was responsible for health hazards, decreased aesthetics, interference with maintenance procedures, safety hazards, and deterioration/corrosion of equipment, materials, and machinery.

Another important problem occurred when starlings, pigeons, and/or house sparrows nested or roosted within buildings. Again, excrement was the primary concern, but avian ectoparasites and damage to building insulation, electrical circuits, and equipment were also important considerations. Also, starlings and house sparrows nested in crevices associated with Civil Works structures. Their excrement and nests contributed to deterioration and failure in mechanical, hydraulic, and electrical components. Canada geese were another major problem at certain grassy public-use areas because they contaminated and damaged the turf and sometimes caused severe destruction. Minor problems reported were agricultural depredations (mainly from blackbirds), competition with native bird species (mainly from starlings), scavenging, and predation.

Based on the research, it was recommended that a workshop be organized to introduce Civil Works personnel to bird management technologies, and to make them aware of the availability of State and Federal contacts for bird damage control and guidance. It was also recommended that funding be generated for additional research to develop technologies for deterring Canada geese from recreational and other public-use areas.

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PREFACE

The study reported here was authorized by Headquarters, U.S. Army Corps of Engineers (HQUSACE), under Civil Works Research Work Unit 32333, "Control of Roosting Birds and Bird Waste," for which Dr. Anthony J. Krzysik is Principal Investigator. Funds for this work were provided through the Repair, Evaluation, Maintenance, and Rehabilitation (REMR) Research Program, Research Area, "Miscellaneous Maintenance and Repair of Hydraulic Structures and Equipment." Mr. James E. Crews (CECW-O-M) was the REMR Technical Monitor for this work.

Mr. Jess A. Pfeiffer, Jr., CERD-C, is the REMR Coordinator at the Directorate of Research and Development, HQUSACE; Mr. James Crews, Dr. Tony C. Liu (CEEC-ED) and Mr. Bruce L. McCartney (CECW-HD) serve as the REMR Overview Committee; Mr. William F. McCleese (CEWES-SC-A). U.S. Army Waterways Experiment Station (WES), is the REMR Program Manager; Dr. Ashok Kumar (CECER-EM) of the U.S. Army Construction Engineering Research Laboratory (USA-CERL) is Problem Area Leader for the Electrical and Mechanical Problem Area.

The clarity of the report benefitted a great deal by the comments of Mr. William F. McCleese, Ms. Jean L. O'Neil, and Dr. James S. Wakeley (WES).

This work was conducted by USA-CERL during the period January 1985 to August 1986 under the general supervision of Dr. R. K. Jain, Chief of the Environmental Division. Special thanks is given to COL Paul J. Theuer (Ret.) for assistance in designing the bird problem questionnaire.

COL Norman C. Hintz is Commander and Director of USA-CERL and Dr. L. R. Shaffer is Technical Director.

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EVALUATION OF BIRD PEST PROBLEMS AT US ARMY CORPS
OF ENGINEERS CIVIL WORKS PROJECTS

PART I: INTRODUCTION

Background

1. Pigeons, starlings, house sparrows, and a few native bird species have been responsible for the majority of bird damage and nuisance problems at U.S. Army Corps of Engineers Civil Works projects. These include economic losses, threats to public health and safety, decreased aesthetics, inconveniences, and competition with native bird species. Control of bird pests has become a sensitive social and political issue since birds are very popular with the public. There is a need for bird control methodologies that alleviate public conflicts. Before management strategies are implemented, the nature and magnitude of Civil Works bird pest problems must be identified.

2. This report represents the second phase of research and provides an evaluation of the bird pest problems at U.S. Army Corps of Engineers Civil Works projects. A previous report* reviewed the variety of damage and nuisance problems caused by birds, and the methods and technologies available to control or manage bird pests. The report also provided a working bibliography for problem solving or obtaining additional information.

Objective

3. The objective of this phase of research was to assess the nature and magnitude of Civil Works bird problems.

*A. J. Krzysik. "A Review of Bird Pests and Their Management," Technical Report REMR-EM-1, US Army Construction Engineering Research Laboratory, Champaign, IL.

Approach

4. A questionnaire was developed to evaluate the nature and magnitude of bird problems at Civil Works projects (Figure 1). Ten questionnaires were mailed to 50 Corps of Engineers District and Division offices (Appendix A) for distribution to individual projects.

5. Questionnaire responses were analyzed in order to:

- a. Assess the specific nature of Civil Works bird problems
- b. Quantify the relative magnitude of the problems
- c. Identify the bird species responsible
- d. Select Civil Works projects that have the most serious and nationally representative problems

6. Data were analyzed with a microcomputer using the Frequencies, Descriptives, Crosstabs, and Means procedures of SPSS/PC+.*

7. A telephone survey was conducted of selected Civil Works projects to augment the information obtained from the questionnaires.

8. On the basis of the telephone survey, 15 projects were chosen as being representative of a broad range of moderate to severe problems.

9. Professional bird control experts assessed the information and suggested management methods for controlling the problems.

*SPSS/PC+. 1986. SPSS Inc., 444 North Michigan Ave., Chicago, IL 60611.

PART II: BIRD PROBLEM QUESTIONNAIRE

Analysis

10. Two hundred sixty-seven projects or management offices representing 35 Districts/Divisions responded to the questionnaire. Fifty-eight of these projects/offices (21.7 percent) reported no significant problems with bird pests. The 209 projects/offices with pest birds identified 783 problem occurrences (Figure 2) based on the list of 16 problems listed in Figure 1. The only other problem, specified in a single instance, was noise. Figure 3 shows the bird species responsible for these problems and the number of problem occurrences. Blackbirds refer to red-winged blackbirds, common grackles, and cowbirds. (Appendix B gives the scientific names of all the bird species referred to in this report.) Infrequently, questionnaire respondents may have included other species in the blackbird group.

11. Although individual questionnaire results were dependent on the subjective evaluation by the respondent, it was felt that project managers, operators, and field personnel were in a good position not only to identify bird problems and the species responsible, but to judge the relative severity or importance of the problems with respect to project operations and maintenance.

12. Table 1 shows the frequency of the eight most numerous problems (and three additional categories) with respect to the bird species responsible. These accounted for 83.1 percent of all reported problems. Table 2 shows similar data for the nine less frequently encountered problems. Both the problems and the bird species are ranked by number of occurrences. Each matrix element represents the frequency that a given bird species was associated with a specific problem (e.g., pigeons were identified with 75 of the 128 [58.6 percent] reported potential health hazards). Since more than one species of bird was often implicated in contributing to a given problem, there were a total of 1472 species-problem occurrences (or in other words, 1.88 [1472/783] bird species were responsible for each occurrence of a specified problem). Therefore, only the last row and last column of the matrix elements sum to 100. For

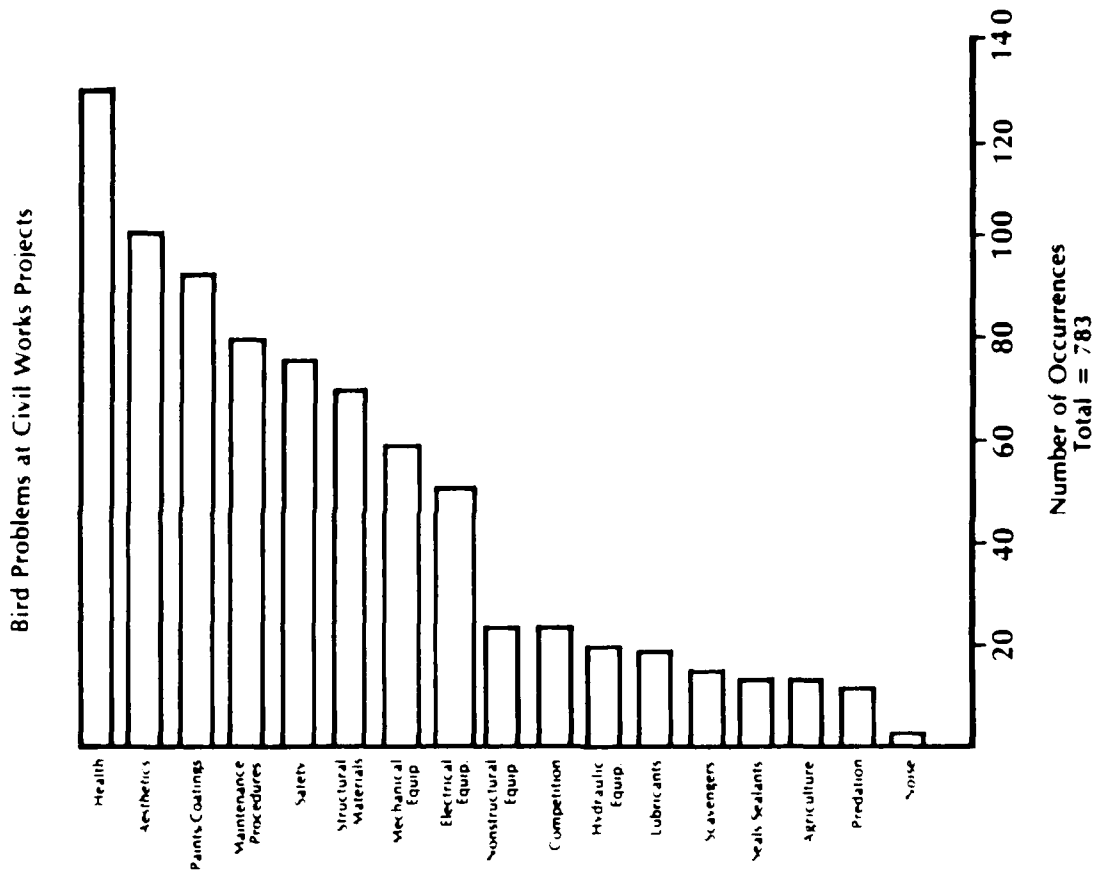


Figure 2. Bird problems reported at Civil Works projects

Birds Pests at Civil Works Projects

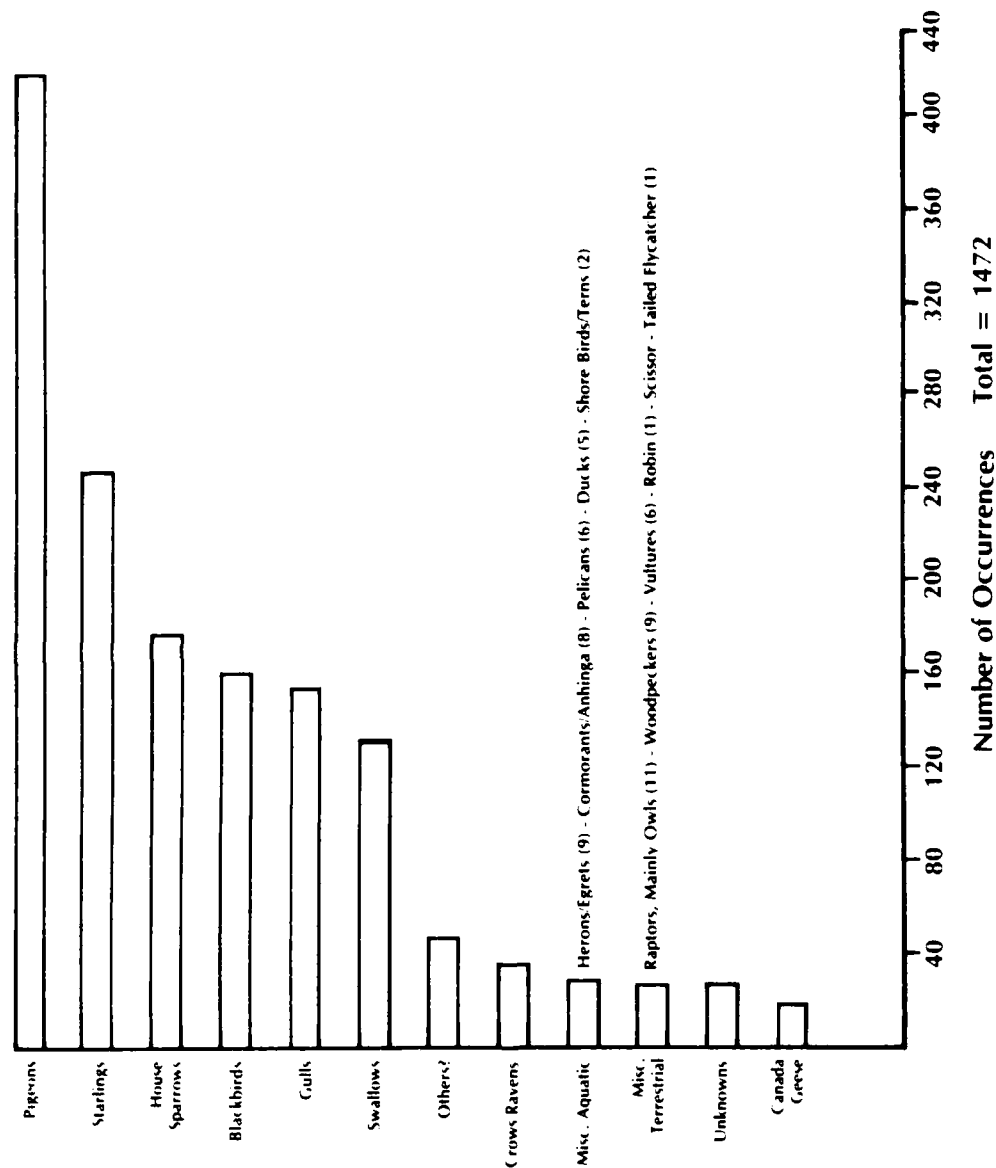


Figure 3. Bird pests at Civil Works projects

example, pigeons were identified as being at least one of the species contributing to avian problems on 418 occasions ($418/783 = 53.4\%$). Correspondingly, their relative frequency in contributing to problems contrasted to all other species was 28.4% ($418/1472$). See Tables 1 and 2.

13. Four problems--potential health hazards, aesthetics, deterioration of paints and coatings, and interference with maintenance procedures--accounted for 51.0 percent of all reported bird problems. Three imported species (pigeons, starlings, and house sparrows) contributed to 57.4 percent of all problems, while the six most important bird pests caused 88.0 percent of all problems. However, the major bird pest species were not disproportionately responsible for either the top four or the top eight main problems (Table 3).

14. A potential problem with small birds has been observed at East Branch Dam, Pittsburgh District (R.C. Armstrong, personal communication). Swallows have been sucked into ventilation shafts and structures. Although the openings are protected by screening, the screens must be periodically cleaned and clogging is a potential problem.

15. Table 4 and Figure 4 summarize the data given in Tables 1 and 2 by ranking the 16 bird problems according to species responsible. Pigeons were consistently the most important contributors to each bird problem they were involved in. They did not contribute significantly to competition, scavenger, agricultural, or predator problems. The combination of starlings and house sparrows was at least the second and third most important pests in nine of the 16 problems. Both of these species ranked in the top four in 75 percent of all problems. The starling was one of the top four contributors to all the bird problems except predation. After the three imported species, blackbirds and gulls were the most important bird pests. Blackbirds contributed mainly to agricultural depredations and scavenging, and less frequently to eight other problems (Table 4). Gulls were responsible for predation and safety hazards, and were less important to seven other problems. Swallows were important contributors to decreased aesthetics, and were of minor importance to three other problems. Crows/ravens were the primary scavengers, and also caused some agricultural damage. Herons/egrets and

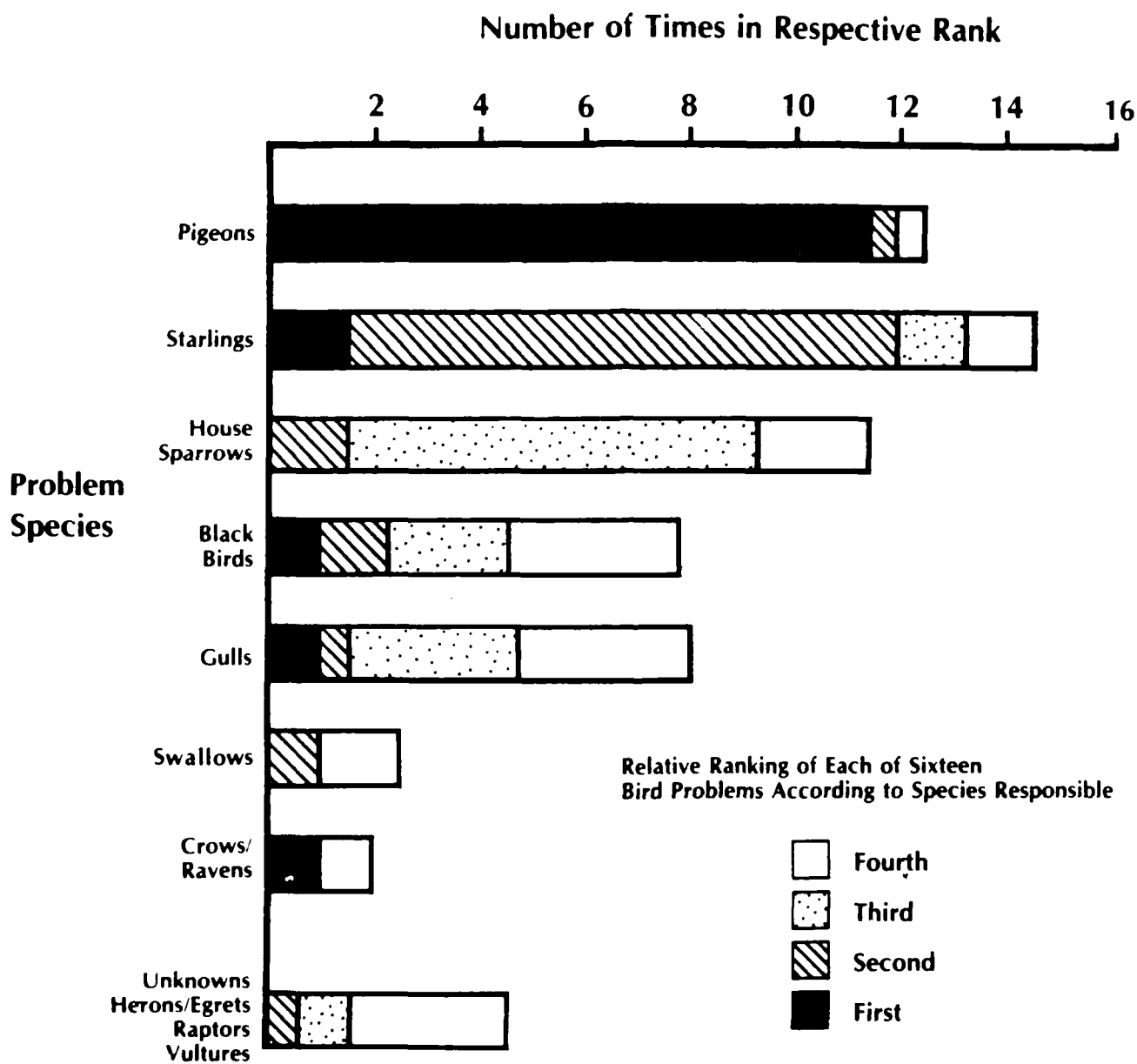


Figure 4. Relative ranking of 16 bird problems according to species responsibility. (The area of each rank is proportional to the number of occurrences of the rank. Note that the total area occupied by each rank is identical.)

raptors (mostly owls) were responsible for predation, and vultures contributed to scavenging.

16. Tables 1 and 2 also provide the data to evaluate each bird pest species in terms of the problems it causes. For each species, asterisks identify specific problems that are disproportionately represented by that species as compared to all the problems it causes. The following equation was derived to quantify these relationships:

$$T_{ij} = \frac{1}{100} \left[\frac{n_{ij} \sum_{i=1}^{16} n_{ij}}{\sum_{j=1}^8 n_{ij}} - \frac{\left(\sum_{i=1}^{16} n_{ij} \right)^2}{\sum_{i=1}^{16} \sum_{j=1}^8 n_{ij}} \right] \quad \text{for } T_{ij} > 2$$

where n_{ij} is the number of problems of type i caused by species j . T_{ij} is represented in Figure 5 as a linear function of circle diameter. Note that the problems are ranked by frequency of occurrence. Pigeons were primarily implicated in corrosion of structural materials, deterioration of paints and coatings, deterioration of mechanical equipment, safety hazards, and health hazards. Starlings contributed to two-thirds of all reported cases of competition with native bird species. Note that starlings and house sparrows were involved in similar problems. Many of these problems resulted when these species built nests within buildings and in crevices associated with lock and dam complexes. The nests and associated excrement damaged electrical and hydraulic equipment, seals, and lubricants. Blackbirds were clearly associated with agricultural depredation. Gulls were responsible for problems with predation, damage to nonstructural materials, decreased aesthetics, and safety hazards. Large colonies of cliff swallows building mud nests on dam faces caused both aesthetic problems and damage to hydraulic equipment and nonstructural materials. Waterfowl and shorebirds produced the fewest problems--mainly decreased aesthetics and health hazards resulting from Canada goose excrement. Crows/ravens were the chief culprits in the miscellaneous terrestrial bird category, with scavenging being their primary problem. They also contributed to health and safety hazards,

BIRD PROBLEMS

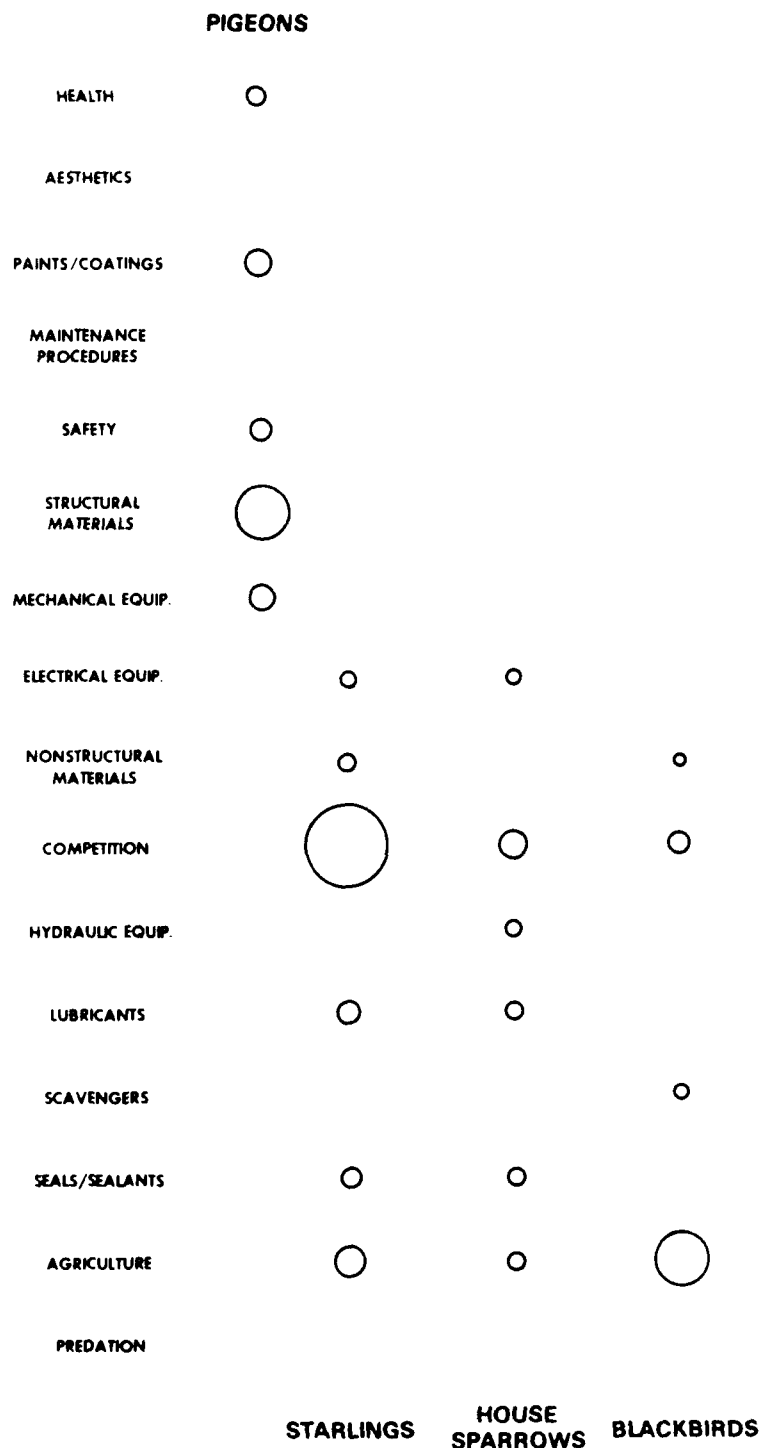


Figure 5. Disproportionately high species contributions to specific bird problems. (See text for calculation and further details.)

BIRD PROBLEMS

HEALTH			
AESTHETICS	○	○	○
PAINTS/COATINGS			
MAINTENANCE PROCEDURES			
SAFETY	○		
STRUCTURAL MATERIALS		○	
MECHANICAL EQUIP.			
ELECTRICAL EQUIP.		○	
NONSTRUCTURAL MATERIALS	○	○	○
COMPETITION			
HYDRAULIC EQUIP.		○	○
LUBRICANTS			
SCAVENGERS		○	
SEALS/SEALANTS			
AGRICULTURE		○	○
PREDATION	○	○	○
	GULLS	MISC. BIRDS (TERRESTRIAL)	MISC. BIRDS (AQUATIC)

Figure 5 (Continued)

decreased aesthetics, and a variety of deterioration/corrosion problems in equipment and materials. Woodpeckers caused minor local damage to structural and nonstructural materials, and to some electrical and mechanical equipment. Vultures were another minor problem, contributing to scavenging and health hazards. A few owls caused predation problems, and several that nested in Civil Works structures posed potential health hazards and interfered with maintenance procedures and electrical equipment. Appendix C summarizes problems identified with miscellaneous bird species.

17. Figure 6 summarizes three parameters of the bird problems: severity, relative occurrence, and immediate cause. Table 5 shows how the projects/offices ranked the severity of their respective bird pest problems on a subjective scale of 1 to 10 (10 being severest). Seventy-five percent of the problems were judged to be "moderate" to "severe," and 10 percent were ranked "very severe." Damages to electrical and mechanical equipment and to structural materials were disproportionately judged to be "very severe." Other severe problems were interference with maintenance procedures, damage to nonstructural materials, and agricultural depredations. Problems with scavengers and predators were disproportionately mild. Deterioration of seals/sealants was judged to be mild or severe, but since sample size was small, conclusions are tenuous.

18. Table 6 shows how the bird species were associated with the relative severity of the problems. For example, pigeons and gulls contributed disproportionately to severe problems, while house sparrows and swallows were more often associated with mild problems.

19. Table 7 shows the relative occurrence of the 17 bird problems. Almost half (45.3 percent) of the problems were always present, and another 40.5 percent were common or usually present. Only 2.5 percent of the problems were rarely encountered. The most persistent problems were damage or deterioration to hydraulic equipment, seals/sealants, structural materials, lubricants, and mechanical equipment. Table 8 gives comparable data in terms of the bird species involved. These data show that pigeons, waterfowl, and shorebirds were persistent problems.

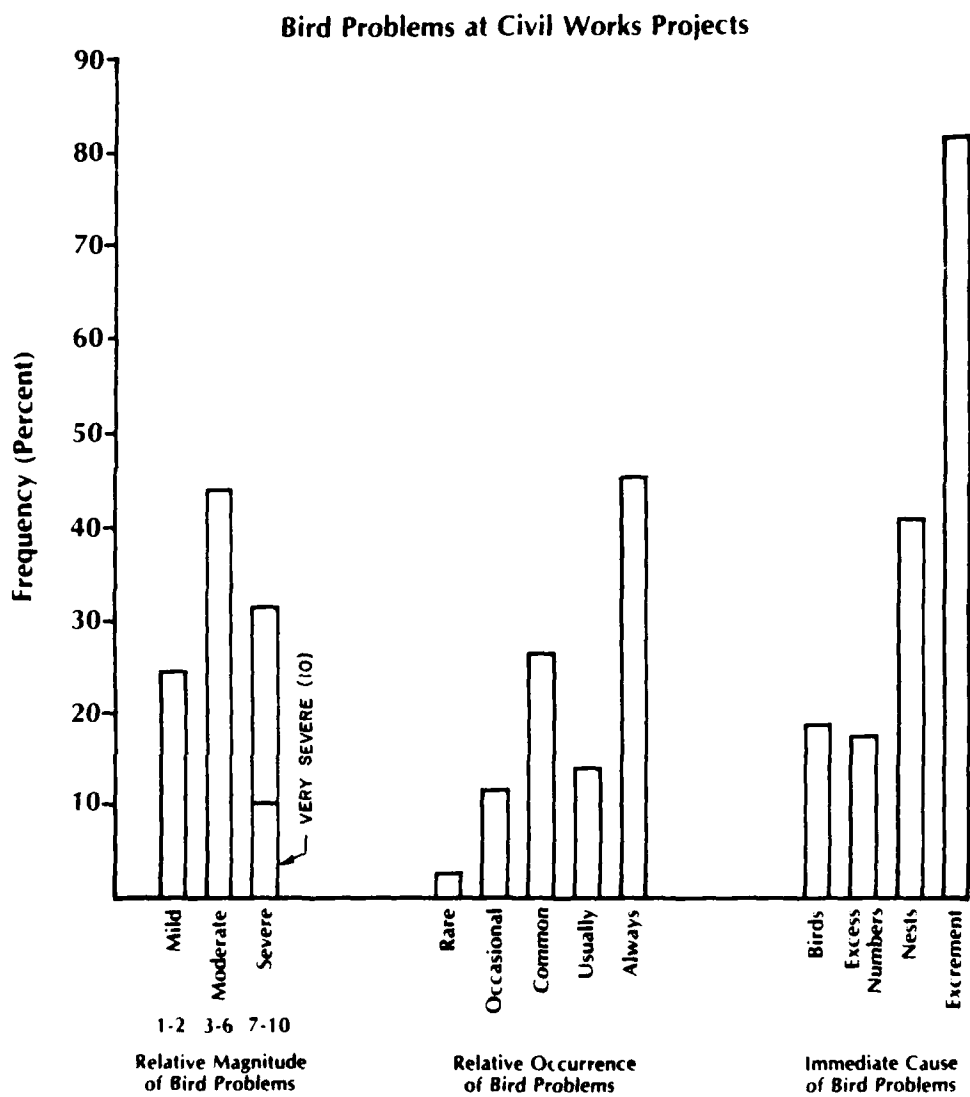


Figure 6. Summary of severity, relative occurrence, and immediate cause of Civil Works bird problems

20. Table 9 gives the frequency of responses on the questionnaire characterizing bird species with three parameters: cause of the problem, season of the year, and temporal occurrences. Bird excrement was the most significant factor. Excrement contributed to 81.6 percent of all bird problems, and to 96.4 percent and 86.3 percent of pigeon and gull problems, respectively. Nests contributed to 40.8 percent of all problems, but to 52.0 percent and 46.5 percent of sparrow and swallow problems, respectively. Most bird problems occurred during the summer and spring, but significant problems were noted all year long. Most problems were associated with daytime activity, since they were most conspicuous at this time. There was no discernible daily pattern to bird problems.

21. Large flocks, numbering in the hundreds to millions, of blackbirds (red-winged blackbirds, common grackles, brown-headed cowbirds) and starlings form temporary roosts from late summer through early spring. Winter roosts may be occupied persistently for many years. These roosts cause obvious aesthetic and noise problems, as well as habitat damage, but the primary concerns are health hazards, particularly histoplasmosis (Krzysik 1987). Although many communities in the southcentral and southeastern United States have locally severe problems with winter blackbird/starling roosts, Civil Works projects were apparently relatively free of this problem.

22. Table 10 ranks 29 U.S. Army Corps of Engineers projects/offices on the relative severity of their bird pest problems. The ranking scores were based on the number of bird problems that the projects/offices reported and the severity of each problem. Bird problems for this analysis were considered only if they were rated as being severe (e.g., a score of 7 or higher). Table 11 summarizes these data on the basis of the 16 U.S. Army Corps of Engineers Districts representing these projects/offices. Districts from all over the country were represented, but the Midwest had the most severe problems (Table 12). The combined problem scores for the West represented only 12 percent of the entire country's scores. Table 13 shows the regional problem scores by bird species. Note that these data consider only the tabulated scores from Table 11 and therefore concern only 29 projects/offices, not the entire data set. The Midwest had the most severe problems with most of the

species. Blackbirds were more of a pest in the Northeast, while aquatic species presented more problems in the Southeast.

23. Since only severe problems were considered in this analysis, there was a bias in the bird species represented in Tables 10, 11, and 13. Pigeons, aquatic species, swallows, and the miscellaneous category of terrestrial species were disproportionately represented at the 29 projects with the severest problems (Table 13). Blackbirds, starlings, and house sparrows were underrepresented since these species caused mainly moderate or mild problems. See Tables 6 and 13. Table 6 shows the magnitude of bird problems at all 209 projects. Considering all projects, pigeons and aquatic species were again disproportionately represented, but gulls were also included. House sparrows definitely tend to cause mild problems. Interestingly, however, a comparison with other species indicates that swallows were responsible for both severe and mild problems.

Summary

24. Pigeons, starlings, and house sparrows represented the predominant bird species responsible for the majority of Civil Works bird pest problems. Bird excrement was the chief concern because of potential health hazards, its corrosive nature, and obvious aesthetic considerations.

25. The most severe and widespread bird problem was pigeons roosting or nesting on large flat-surfaced structures in open areas (e.g., lock and dam complexes, bridges, power generating stations). Similar localized problems occurred with gulls at lock and dam complexes and reservoirs. In scattered localities, large spring breeding colonies of cliff swallows build mud nests on dam faces. The most immediate concern with these birds is their excrement. Bird excrement creates potential health hazards such as histoplasmosis, cryptococcosis, and chlamydiosis (Krzysik 1987). It also decreases aesthetics, interferes with maintenance schedules and procedures, and causes deterioration, corrosion, or failure in paints/coatings, structural and nonstructural materials, mechanical, electrical, and hydraulic equipment, lubricants/lubricating systems, and seals/sealants. Excrement is a safety hazard because it makes surfaces

slippery or causes personnel to use avoidance maneuvers. It also requires costly time-consuming sanitation procedures.

26. An important avian problem was the nesting and roosting of starlings, pigeons, and/or house sparrows (in order of importance) in buildings such as warehouses, boathouses, garages, storage sheds, and crane houses. Again, bird excrement was the major problem, but there were also several other serious problems. Birds, their nestlings, and their nests are infected with an usually large number of ectoparasites. These organisms, especially bird mites, may be transmitted to humans, sometimes in very large doses. Some people have an allergic skin reaction to bird mites, and a few species can parasitize human or canine skin. Bird mites from nesting starlings were a serious problem in at least one Civil Works boathouse. Birds nesting in buildings, especially starlings, severely damaged fiberglass or styrofoam insulation. The birds, their nests, or their excrement can damage electrical circuits, creating a fire hazard. Starling and house sparrows (both cavity nesters) also nested in crevices and small openings at navigation and flood gates and other Civil Works structures. Again, their excrement or nests caused problems or failure in mechanical moving parts, hydraulic components, and electrical equipment.

27. Several other species presented problems, most of which were small and localized (e.g., pelicans and cormorants in Florida, anhingas and vultures in Alabama). The problems caused by these miscellaneous species were very similar to those caused by pigeons and gulls--primarily bird excrement, with its potential health hazards and corrosive properties.

28. Minor problems reported at Civil Works projects included: (a) the concern that starlings, house sparrows, and blackbirds were competing with native species,* (b) scavenging by crows/ravens, blackbirds, vultures, and starlings, and (c) predation by raptors (especially owls), or fish predation by herons/egrets.

29. The survey indicated a few cases of agriculture depredations, mainly by blackbirds, but also by starlings, house sparrows, and crows.

*Starlings and house sparrows compete strongly for nest sites with native cavity nesters; probably the major problem with blackbirds is nest predation by grackles.

PART III: TELEPHONE SURVEY AND CONTACTS WITH BIRD CONTROL EXPERTS

Telephone Survey

30. The data given in Table 10 provided the basis for assessing bird problems at individual projects. All these Districts, most of the individual projects, and several additional Districts were contacted by telephone to acquire more detailed information about bird pest problems. Appendix D summarizes the telephone survey.

31. Unexpectedly, the telephone survey indicated that many of the bird problems may not have been as severe as the data from the questionnaires (Table 10) indicated. Was the filling in of questionnaire blanks or a personal telephone conversation more representative or realistic of actual bird pest problems? Many projects had already or were going to contract private pest control firms or state animal damage control specialists. As a result, some bird problems had been eliminated or their severity reduced appreciably. Specific recommendations were made to control bird problems whenever the problem was well defined.

Contacts With Bird Control Experts

32. On the basis of the telephone survey, 15 projects were selected using two criteria: (1) the project had moderate to severe bird problems and (2) the project demonstrated a representative sample of a broad range of Civil Works bird problems. The 15 projects represented 9 Districts (Appendix E). The data were provided to five professional bird control experts (Appendix F). The experts contacted personnel of the 15 selected projects to provide additional expertise in assessing the problems and to make specific control recommendations. They made additional contacts with the Animal Damage Control Directors for the Eastern and Western Regions, along with selected Field Stations of the Animal Damage Control Division, U.S. Department of Agriculture.

33. Some of the projects had already contacted state animal damage control experts or private pest control firms, and several problems were being resolved. The U.S. Department of Agriculture personnel made

specific recommendations for resolving the problems and provided project managers with the appropriate agency contacts to locate local, State, or Federal bird damage control experts.

34. The consensus of the bird damage control experts was that most Civil Works bird problems did not warrant further research. The problems were common enough that appropriate management tools were already well known. However, one problem was identified for which research was warranted--that of Canada geese at Cordell Hull, Percy Priest, and Old Hickory Reservoirs near Nashville, TN. The Pittsburgh District has reported health hazards with Canada goose and mallard excrement at Shenango River Lake (R.C. Armstrong, personal communication). Canada geese are rapidly becoming a major nuisance in public-use areas of many lakes and reservoirs, particularly in the central and eastern United States. Their excrement and habit of grazing on short grass contaminates and damages lawns and grassy areas such as campgrounds, golf courses, ball fields, beaches, picnic areas, and private and public lawns/gardens. The excrement besides being a potentially serious health hazard (Krzysik 1987), also causes local severe eutrophication of ponds. Canada goose problems are most severe in mid to late summer when adult and fledgling geese begin flocking. In addition, the geese occasionally frighten people and are a possible hazard to small children, since they may be belligerent when begging for food and extremely aggressive when defending their nests or fledglings. The Canada geese problem has the potential of becoming one of the most severe bird problems in the future. Additionally, the problem is complicated by politics since the Canada goose is a highly desirable game species and populations are managed by Federal and State game agencies. Field research directed at the Canada geese problem was therefore initiated in July 1986 at Cordell Hull and Percy Priest Reservoirs.

PART IV: CONCLUSIONS

35. The management of any bird pest species requires site- and species-specific strategies which may take some time to implement effectively. Analysis of the Civil Works bird problem questionnaire responses and subsequent contact with selected Districts and Projects have effectively focused the nature and magnitude of Civil Works bird problems. Most incidents could be classified within several categories of problems identified in the study.

36. Currently, the problems with Canada geese are localized, primarily in the northeastern and central United States. This is a relatively new problem, but has the potential for becoming quite serious in the future. Their habit of grazing on short grass and their excrement damages and contaminates lawns and grassy areas and constitutes a health hazard at public-use and recreational facilities at some Civil Works reservoirs. Also, their occasional belligerence and aggressiveness poses safety hazards to people, particularly small children. This problem needs additional research to develop environmentally acceptable technology to repel, frighten, lure, or relocate the geese from areas where they are undesirable.

37. Bird damage control experts concluded that most Civil Works bird problems could be solved by available management tools. However, they recommended research to develop methodologies for repelling Canada geese.

38. Many Civil Works project managers and operators were unaware that State or Federal agency personnel are available as consultants for bird or wildlife damage control. These agencies can provide expertise and guidance and can administer control strategies that use toxins or other technologies that are registered for use only by agency personnel.

PART V: RECOMMENDATIONS

39. Two recommendations have been made on the basis of research conducted during this study:

a. A workshop should be organized for participation by bird damage control experts from the Animal Damage Control Section of the Department of Agriculture and Civil Works personnel responsible for management, maintenance, or operation of individual projects. The purpose of the workshop would be to introduce project personnel to available bird management technologies and make them aware of the availability of State and Federal contacts for guidance and bird damage control. Feedback to the Department of Agriculture may generate research having direct application to Civil Works bird problems.

b. Funding should be generated for research to develop technology that will repel, frighten, lure, or relocate Canada geese from recreational sites, public-use facilities, and other areas where concentrated flocks are undesirable.

Table 1

Frequency (Percent) of Bird Pest Problems According to Bird Species^a

Problem	Problem Rank	Species							All Species (Relative Frequency)		
		Pigeons	Starlings	House Sparrows	Black-birds ^a	Gulls	Terrestrial Birds ^b	Swallows ^c	Aquatic Birds ^d	N ^e	
All Problems		53.4	31.7	22.9	20.7	19.8	17.3	17.0	5.6	783	100
Health Hazards	1	58.6**	28.9	21.1	18.8	21.1	13.3	15.6	8.6	128	16.3
Aesthetics	2	41.0	26.0	17.0	13.0	27.0**	12.0	28.0**	14.0**	100	12.8
Paints/Coatings	3	63.0**	33.7	22.8	18.5	17.4	11.1	16.3	1.1	92	11.7
Maintenance Procedures	4	58.2	26.6	21.5	19.0	12.7	15.4	19.0	3.8	79	10.1
Safety	5	60.0**	26.7	25.3	21.3	26.7**	12.0	13.3	6.7	75	9.6
Structural Materials	6	71.0**	29.0	20.3	21.7	18.8	24.6**	14.5	5.8	69	8.8
Mechanical Equipment	7	62.1**	34.5	20.7	19.0	12.1	14.3	19.0	0.0	58	7.4
Electrical Equipment	8	56.0	38.0**	30.0**	22.0	16.0	22.9**	14.0	2.0	50	6.4
Other Materials and Equipment ^f		47.2	38.9**	30.6**	22.2	23.6	26.2**	18.1	1.4	72	9.1
Miscellaneous ^g		10.0	43.3**	25.0	40.0**	16.7	33.3**	6.7	6.7	60	7.6

^aSee text for interpretation.^bFor a specific species, exceeds frequency for all problems combined by more than 5 percent.^cBlackbirds, generic blackbirds, grackles, cowbirds.^dUnknowns, crows, ravens, vultures, woodpeckers, raptors, robins, scissor-tailed flycatchers.^eCliff and barn swallows, chimney swifts.^fCanada geese, ducks, herons, egrets, anhingas, pelicans, cormorants, terns, shorebirds, coots.^gNonstructural materials, hydraulic equipment, lubricants, seals/sealants.^hCompetition, scavengers, agriculture, predation, noise.

Table 1 (Continued)

Problem	Species							N ^e
	Pigeons	Starlings	House Sparrows	Black-birds ^a	Gulls	Terrestrial Birds ^b	Swallows ^c	Aquatic Birds ^d
N (All Problems)	418	248	179	162	155	133	133	44
Four Most Common Problems (Relative Frequency)	30.4	15.9	11.3	9.5	11.0	7.0	10.8	4.0
Eight Most Common Problems (Relative Frequency)	31.1	16.0	11.7	10.0	10.5	7.9	9.5	3.2
All Problems (Relative Frequency)	28.4	16.8	12.2	11.0	10.5	9.0	9.0	3.0

^a Blackbirds, generic blackbirds, grackles, cowbirds.

^b Unknowns, crows, ravens, vultures, woodpeckers, raptors, robins, scissor-tailed flycatchers.

^c Cliff and barn swallows, chimney swifts.

^d Canada geese, ducks, herons, egrets, anhingas, pelicans, cormorants, terns, shorebirds, coots.

^e N = number of occurrences.

Table 2

Frequency (Percent) of Less Common Problems According to Bird Species*

Problem	Problem Rank	Species							All Species (Relative Frequency)		
		Pigeons	Starlings	House Sparrows	Black-birds	Gulls	Terr. Birds	Swallows	Aquatic Birds	N	
All Problems		53.4	31.7	22.9	20.7	19.8	17.3	17.0	5.6	783	100
Nonstructural Materials	9	39.1	39.1**	26.1	26.1**	30.4**	27.3**	26.1**	4.3	23	2.9
Competition	10	8.7	69.6**	47.8**	39.1**	8.7	8.7	4.3	0	23	2.9
Hydraulic Equipment	11	47.4	31.6	31.6**	21.1	21.1	35.3**	26.4**	0	19	2.4
Lubricants	12	55.6	44.4**	33.3**	22.2	22.2	18.8	5.6	0	18	2.3
Scavengers	13	7.1	14.3	0	28.6**	14.3	85.7**	7.1†	0	14	1.8
Seals/Sealants	14	50.0	41.7**	33.3**	16.7	16.7	20.0	8.3	0	12	1.5
Agriculture	15	25.0†	50.0**	33.3**	66.7**	8.3	25.0**	0	16.7**	12	1.5
Predation	16	0	20.0†	0	20.0	50.0**	30.0**	20.0†	20.0**	10	1.3
Noise	17	0	0	0	100.0	0	0	0	0	1	0.1
N		40	54	37	40	27	37	17	5	257	
Uncommon Problems (Relative Frequency)		15.6	21.0	14.4	15.6	10.5	14.4	6.6	1.9		

*Species Nomenclature is in Table 1.

**For a specific species, exceeds frequency for all problems combined by more than 5 percent.

†Data are from questionnaire, but validity is uncertain.

Table 3
Ranked Problems Caused by
the Major Bird Pests

	Pigeons	Pigeons Starlings House Sparrows	Pigeons Starlings House Sparrows Blackbirds Culls Swallows
All Problems	28.4*	57.4	88.0
Top 8 Problems**	31.1	58.8	88.9
Top 4 Problems	30.4	57.6	89.0

*Values are percent.

**See Table 1.

Table 4

Summary of Tables 1 and 2 To Emphasize Species
Ranking For Each Problem

Problems Ranked in Order of Importance	Problems Ranked by Species*				
	#1	#2	#3	#4	#5
All Problems	Pigeons 53.4**	Starlings 31.7	Sparrows*** 22.9	Blackbirds 20.7	--
Health Hazards	Pigeons 58.6	Starlings 28.9	Gulls 21.1	Sparrows 21.1	--
Aesthetics	Pigeons 41.0	Swallows 28.0	Gulls 27.0	Starlings 26.0	--
Paints/ Coatings	Pigeons 63.0	Starlings 33.7	Sparrows 22.8	Blackbirds 18.5	--
Maintenance Procedures	Pigeons 58.2	Starlings 26.6	Sparrows 21.5	Swallows 19.0	Blackbirds 19.0
Safety	Pigeons 60.0	Gulls 26.7	Starlings 26.7	Sparrows 25.3	--
Structural Materials	Pigeons 71.0	Starlings 29.0	Blackbirds 21.7	Gulls 18.8	Unknowns 18.8
Mechanical Equipment	Pigeons 62.1	Starlings 34.5	Sparrows 20.7	Swallows 19.0	Blackbirds 19.0
Electrical Equipment	Pigeons 56.0	Starlings 38.0	Sparrows 30.0	Gulls 16.0	--
Nonstructural Materials	Starlings 39.1	Pigeons 39.1	Gulls 30.4	Blackbirds 26.1	Sparrows 26.1
Competition	Starlings 69.6	Sparrows 47.8	Blackbirds 39.1	Gulls 8.7	Pigeons 8.7
Hydraulic Equipment	Pigeons 47.4	Sparrows 31.6	Starlings 31.6	Swallows 26.4	Unknowns 26.4
Lubricants	Pigeons 55.6	Starlings 44.4	Sparrows 33.3	Gulls 22.2	Blackbirds 22.2
Scavengers	Crows/Ravens 64.3	Blackbirds 28.6	Vultures 14.3	Gulls 14.3	Starlings 14.3
Seals/ Sealants	Pigeons 50.0	Starlings 41.7	Sparrows 33.3	Unknowns 16.7	--
Agriculture	Blackbirds 66.7	Starlings 50.0	Sparrows 33.3	Crows/Ravens 25.0	--
Predation	Gulls 50.0	Hérons/ Egrets 20.0	Raptors 20.0	Blackbirds 20.0	--

*In case of ties, the species that deviated the most from its contribution to all problems received the higher ranking.

**Values are percent.

***Sparrows = House sparrows.

Table 5

Frequency (Percent) of Bird Problems
According to Their Relative Severity

Problem	Severity*				N
	Mild 1 or 2	Moderate 3 through 6	Severe 7 through 10	(Very Severe) 10	
All Problems	24.6	43.9	31.4	(10.2)	783
Health	22.1	48.9	29.2	(10.2)	127
Aesthetics	29.5	44.1	26.3	(11.6)	95
Paints/ Coatings	21.6	47.7	30.7	(8.0)	88
Maintenance Procedures	20.8	40.3	39.0**	(7.8)	77
Safety	22.7	45.3	32.0	(12.0)	75
Structural Materials	21.5	38.4	40.0**	(13.8)	65
Mechanical Equipment	26.0	42.7	31.5	(14.8)	54
Electrical Equipment	24.4	42.3	33.4	(15.6)**	45
Competition	22.7	59.1**	18.1	(0)	22
Nonstructural Materials	23.8	38.1	38.1**	(9.5)	21
Hydraulic Equipment	23.5	47.0	29.5	(5.9)	17
Lubricants	31.3**	37.6	31.3	(12.5)	16
Scavengers	50.0**	42.8	7.1	(0)	14
Agriculture	27.3	36.4	36.4	(0)	11
Seals/ Sealants	40.0**	20.0	40.0**	(10.0)	10
Predation	44.4**	33.3	22.2	(0)	9
All Problems	24.6	43.9	31.4	(10.2)	783
Noise	-	100.0	-	-	1
Missing Values					36

*Severity was ranked on a relative scale of 1 to 10.

**Exceeds frequency for all problems combined by more than 5 percent.

Table 6

Frequency (Percent) of Bird Problem Relative Severity
According to Bird Species*

Magnitude	Species							
	Pigeons	Starlings	House Sparrows	Black-birds	Gulls	Terrestrial Birds	Swallows	Aquatic Birds
Mild (1 or 2)	16.3	24.7	36.7**	29.5	24.5	24.6	32.8**	23.8
Moderate (3 through 6)	43.8	46.1	37.8	45.3	44.8	47.0	39.0	38.1
Severe (7 through 10)	40.0**	29.1	25.4	25.1	30.8	28.4	28.2	38.1**
Very Severe (10)	17.0**	8.5	5.6	11.3	16.8**	11.5	1.5	11.9

*Species Nomenclature is in Table 1.

**Exceeds frequency for all bird species combined by more than 5 percent.

	Relative Severity of Problem	N	10 Classes (Frequency)	3 Classes (Frequency)
Mild	1	109	14.6	24.6
	2	75	10.0	
Moderate	3	69	9.2	43.9
	4	78	10.4	
	5	101	13.5	
	6	81	10.8	
Severe	7	61	8.2	31.4
	8	56	7.5	
	9	41	5.5	
	10	76	10.2	
Total	Data Not Reported	36	-	99.9
		783	99.9	

Table 7

Frequency (Percent) of Bird Problems
According To Relative Occurrence

Problem	Always	Usually	Common	Occasional	Rare	N
All Problems	45.3	14.2	26.3	11.7	2.5	783
Health	46.4	11.2	24.0	14.4	4.0	125
Aesthetics	45.7	16.0	22.3	14.9	1.1	94
Paint/ Coatings	53.9*	14.6	28.1	3.4	0	89
Maintenance Procedures	34.2	18.4	31.6*	14.5	1.3	76
Safety	49.3	16.0	14.7	16.0	4.0	75
Structural Materials	53.0*	13.6	24.2	6.1	3.0	66
Mechanical Equipment	51.8*	10.7	23.2	12.5	1.8	56
Electrical Equipment	48.9	8.5	29.8	10.6	2.1	47
Competition	21.7	21.7*	52.2*	4.3	0	23
Nonstructural Materials	45.5	18.2	22.7	13.6	0	22
Hydraulic Equipment	55.6*	16.7	27.8	0	0	18
All Problems	45.3	14.2	26.3	11.7	2.5	783
Lubricants	52.9*	5.9	35.3*	0	5.9	17
Scavengers	0	7.7	38.5*	53.8*	0	13
Seals/ Sealants	54.5*	18.2	0	0	27.3*	11
Agriculture	9.1	27.3*	54.5*	9.1	0	11
Predation	11.1	11.1	44.4*	22.2*	11.1*	9
Noise			100.0			1
Data Not Reported						30

*Exceeds frequency for all problems combined by more than 5 percent.

Table 8

Frequency (Percent) of Problem's Relative
Occurrence According to Bird Species*

Occurrence	Species						All Species
	Pigeons	Starlings	House Sparrows	Black- birds	Gulls	Terr. Birds	Aquatic Birds
Rare	2.4	2.4	4.5	4.9	5.4	3.1	0.
Occasional	6.8	6.9	9.0	12.3	9.5	17.1**	7.5
Common	23.2	34.8**	36.7**	42.6**	34.5**	33.3**	25.0
Usually	11.0	10.5	11.9	13.6	10.1	15.5	15.0
Always	56.6**	45.3	37.9	26.5	40.5	31.0	52.5**
							<u>45.3</u>
							100.

*Species Nomenclature is in Table 1.

**Exceeds frequency for all bird species combined by more than 5 percent.

Table 2

Frequency (Percent) of Three Problem Parameters
According to Bird Species*

Problem Parameter	Species						
	Pigeons	Starlings	House Sparrows	Black- birds	Gulls	Terr. Birds	Aquatic Birds
<u>Cause:</u>							
Birds							
Themselves	15.0	19.8	23.2	26.9**	18.3	36.2**	11.6
Excess Numbers	17.7	23.4**	23.2**	24.4**	20.3	26.8**	11.6
Excrement	96.4**	85.1	80.2	78.8	86.3	70.9	81.4
Nests	40.8	38.7	52.0**	30.0	30.1	44.9	0.
							46.5**
							40.8
<u>Season:</u>							
Winter	64.6**	47.3	36.7	33.8	40.0	24.8	46.5
Spring	91.2	86.5	81.6	80.3	76.6	82.4	79.1
Summer	94.5**	89.2	87.3	87.3	79.3	88.0	81.4
Fall	77.9**	64.4**	50.6	49.0	52.4	44.8	53.5
<u>Temporal:</u>							
Morning	68.0	62.0	46.6	54.1	54.5	64.5	71.4**
Evening	64.3	60.5	46.6	52.1	48.5	53.3	45.7
Day	90.5	84.0	75.2	78.1	81.8	77.6	97.1**
Night	73.2**	69.0**	61.7	56.2	59.1	60.7	57.1

*Species Nomenclature is in Table 1.

**Exceeds frequency for all bird species combined by more than 5 percent.

†Data are from questionnaire, but validity is uncertain.

Table 10

U.S. Army Corps of Engineers Civil Works Projects Ranked
by Severity of Reported Bird Problems*

Project Rank (Over all Species)	Project	District**	Sum of Scores	Pigeons	Starlings	House Sparrows	Gulls	Black-birds	Swallows	Terrestrial Birds	Species	Aquatic Birds	Species
1	St. Mary's Falls Canal	NCE	330***	110 (1)††			110 (1)			110 (1)	Others†††		
2	Sayers	NAB	210	70 (3a)		70 (2)		70 (1)		60 (2)	Unknown		
3	Cheatham	ORN	180	60 (4)	60 (2)								
4	McNary	NPW	162	54 (5)	54 (3)		54 (2)						
5	Lock & Dam #52	ORL	160	80 (1)	80 (1)								
6	Miss. R. & Ill.												
7	Waterway	NCR	144	48 (6)	48 (4)			48 (2)					
8	Emsworth	ORP	120	40 (8)	40 (5)			40 (3)					
9	Jim Woodruff	SAM	112	28 (13a)			28 (4)			28 (4)	Crows	28 (1a)	Anhingas
10	Lock & Dam #1	NCS	98		32 (6)	32 (4)		98 (1)					
11	Huntington Lake	ORL	96	32 (11)		47 (3)							
12	McAlpine	ORL	84	37 (9a)									
13	Indian Rock†	NAB	80	80 (2)									
14	Pike Island	ORP	70	70 (3b)		30 (3)			30 (3)	Crows			
15a	Walter P. George	SAM	60										
15b	Curwensville	NAB	56					56 (2)					
16	Lock & Dam #9	KCS	56	28 (13b)				27 (4)	27 (5)	Owls		28 (1b)	Gr. Blue Herons
17	John Martin	SWA	54	45 (7)									
18	Indian Rock†	NAB	45										
19	St. Anthony's Falls	NCS	37	37 (9b)									
20a	Hartwell (2v)	SAS	36	36 (10)									
20b	Lake Francis Case	MRO	31	31 (12)									
21	Hensley	SPK	31		31 (5)								
22	Baldhill Dam	NCS	30					30 (3)				20 (2)	Canada Geese
23a	Cordell Hull Res.	ORN	20									17 (3)	Cormorants
23b	Lake Sonoma	SAJ	17									10 (4a)	Heron
24a	Lock & Dam #7	SPK	17					17 (5)				10 (4b)	Pelicans
24b	Jax. Dist. Off.	NCS	10									7 (5a)	Canada Geese
25a	Cottage Grove Lake	SAJ	10									7 (5b)	Canada Geese
25b	Westville Lake	NPP	7										
		NED	7										
	SUM			806	314	260	222	158	228	255		127	

*Only problems reported having a magnitude ≥ 7 were considered in the analysis.

**See Appendix A.

***Values are problem scores calculated as $\sum_{i=1}^{10} x_i$, where x_i is the number of bird problems of magnitude i . A problem of magnitude 10 was considered very severe.

†Two questionnaires returned.

††The numbers in parentheses are project ranks for each specific bird species.

†††"Others" category from questionnaire.

Table 11

U.S. Army Corps of Engineers Districts Ranked by
Severity of Reported Bird Problems*

Rank	District	Number of Projects**	Sum of Species Scores	Problem Scores						Aquatic Birds	Location***
				Pigeons	Starlings	House Sparrows	Gulls	Black- birds	Swallows	Terrestrial Birds	
1	Louisville	3	340	69	112	150					MW
2	Detroit	1	330	110						110	MW
3	Baltimore	3	311	115		70	110	70	56		NE
4	St. Paul	5	231	65					128		MW
5	Nashville	2	200	60	60					60	SE
6	Pittsburgh	2	190	110				40		20	NE
7	Walla Walla	1	162	54	40		54				NW
8	Rock Island	1	144	48	48			48			MW
9	Mobile	2	142	28			58			28	SE
10	Albuquerque	1	54							27	SW
11	Sacramento	2	48			31			27	17	SW
12	Savannah	1	36	36							SE
13	Omaha	1	31	31							MW
14	Jacksonville	2	27							27	SE
15a	Portland	1	7							7	NW
15b	New England Division	1	7							7	NE
SUM				726	314	260	222	158	228	225	127

*Data compiled from Table 10.

**Projects with significant bird problems. See Table 10.

***MW = Midwest; NE = Northeast; SE = Southeast; NW = Northwest; SW = Southwest.

Table 12

Geographic Distribution of U.S. Army Corps of Engineers
Districts Reporting Severe (Magnitude ≥ 7) Bird Problems*

Project Location	Number of Projects	Number of Districts	Sum of Problem Scores	Proportion of Problems (Percent)
Midwest	11	5	1076	47.6
Northeast	6	3	508	22.5
Southeast	7	4	405	17.9
Northwest	2	2	169	7.5
Southwest	3	2	102	4.5
N	29	16	2260	100

*Data compiled from Table 11.

Table 13

Geographic Distribution of Severe (Magnitude ≥ 7) Bird Problems
According to Bird Species Involved*

District Location	Number of Districts	Problem Scores							
		Pigeons	Starlings	House Sparrows	Gulls	Black-birds	Swallows	Terrestrial Birds	Aquatic Birds
Midwest	5	323	160	159	110	48	128	110	38
Northeast	3	225	40	70	0	110	56	0	7
Southeast	4	124	60	0	58	0	0	88	75
Northwest	2	54	54	0	54	0	0	0	7
Southwest	2	0	0	31	0	0	44	27	0
Sum		726	314	260	222	158	228	225	127
Frequency**		32.1†	13.9	11.5	9.8	7.0	10.1†	10.0†	5.6†
Frequency*** (from Table 1)		28.4	16.8	12.2	10.5	11.0	9.0	9.0	3.0

*Data compiled from Table 11.

**Severe problems (Magnitude ≥ 7) at the 29 Civil Works projects (Table 10).

***All problems from all 209 Civil Works projects.

†These species were more frequently reported at projects having severe bird problems.

APPENDIX A: U.S. ARMY CORPS OF ENGINEERS DISTRICTS AND DIVISIONS
RECEIVING BIRD PROBLEM SURVEY QUESTIONNAIRE

U.S. Army Engineer Division, Huntsville (HND)
U.S. Army Engineer Division, Lower Miss. Valley, ATTN: LMVED-T (LMV)
U.S. Army Engineer District, Memphis (LMM)
U.S. Army Engineer District, New Orleans (LMN)
U.S. Army Engineer District, St. Louis (LMS)
U.S. Army Engineer District, Vicksburg (LMK)
U.S. Army Engineer Division, Middle East (Winchester) (MED)
U.S. Army Engineer Division, Missouri River, ATTN: MRDCO-O (MRD)
U.S. Army Engineer District, Kansas City (MRK)
U.S. Army Engineer District, Omaha (MRO)
U.S. Army Engineer Division, New England, ATTN: NEDOD-P (NED)
U.S. Army Engineer Division, North Atlantic, ATTN: NADEN-TF (NAD)
U.S. Army Engineer District, Baltimore and Supervisor of Baltimore Harbor (NAB)
U.S. Army Engineer District, New York, and Supervisor of New York Harbor (NAN)
U.S. Army Engineer District, Norfolk, and Supervisor of Norfolk Harbor (NAO)
U.S. Army Engineer District, Philadelphia (NAP)
U.S. Army Engineer Division, North Central, ATTN: NCECO-O (NCD)
U.S. Army Engineer District, Buffalo (NCB)
U.S. Army Engineer District, Chicago (NCC)
U.S. Army Engineer District, Detroit (NCE)
U.S. Army Engineer District, Rock Island (NCR)
U.S. Army Engineer District, St. Paul (NCS)
U.S. Army Engineer Division, North Pacific, ATTN: NPDEN-T (NPD)
U.S. Army Engineer District, Alaska (NPA)
U.S. Army Engineer District, Portland (NPP)
U.S. Army Engineer District, Seattle (NPS)
U.S. Army Engineer District, Walla Walla (NPW)
U.S. Army Engineer Division, Ohio River, ATTN: ORDCO-M (ORD)
U.S. Army Engineer Division, Ohio River, ATTN: ORDED-T (ORD)
U.S. Army Engineer District, Huntington (HND)
U.S. Army Engineer District, Louisville (ORL)
U.S. Army Engineer District, Nashville (ORN)
U.S. Army Engineer District, Pittsburgh (ORP)
U.S. Army Engineer Division, South Atlantic, ATTN: SADEN-F (SAD)
U.S. Army Engineer Division, Charleston (SAC)

U.S. Army Engineer District, Jacksonville (SAJ)
U.S. Army Engineer District, Mobile (SAM)
U.S. Army Engineer District, Savannah (SAS)
U.S. Army Engineer District, Wilmington (SAW)
U.S. Army Engineer Division, South Pacific, ATTN: SPDCO-O (SPD)
U.S. Army Engineer District, Los Angeles (SPL)
U.S. Army Engineer District, Sacramento (SPL)
U.S. Army Engineer District, San Francisco (SPN)
U.S. Army Engineer Division, Southwestern, ATTN: SWDCO-O (SWD)
U.S. Army Engineer District, Albuquerque (SWA)
U.S. Army Engineer District, Fort Worth (SWF)
U.S. Army Engineer District, Galveston (SWG)
U.S. Army Engineer District, Little Rock (SWL)
U.S. Army Engineer District, Tulsa (SWT)
U.S. Army Engineer Division, Pacific Ocean, ATTN: PODEN-T (POD)

APPENDIX B: SCIENTIFIC NAMES OF BIRD
SPECIES NOTED IN THIS RESEARCH

Pigeon or rock dove		<u>Columba livia</u>
European starling		<u>Sturnus vulgaris</u>
House or English Sparrow		<u>Passer domesticus</u>
Gulls ¹	Ring-billed gull	<u>Larus delawarensis</u>
	California gull	<u>Larus californicus</u>
Blackbirds ²	Red-winged blackbird	<u>Agelaius phoeniceus</u>
	Common grackle	<u>Quiscalus quiscula</u>
	Brown-headed cowbird	<u>Molothrus ater</u>
Swallows ³	Cliff swallow	
	(usually large colonies)	<u>Hirundo pyrrhonota</u>
	Barn swallow	
	(small colonies	
	or solitary)	<u>Hirundo rustica</u>
	Chimney swift (Apodidae)	<u>Chaetura pelagica</u>
Terrestrial Species	American crow ⁴	<u>Corvus brachyrhynchos</u>
	Common raven ⁵	<u>Corvus corax</u>
	Great-horned owl	<u>Bubo virginianus</u>
	Vulture ⁶	
	American robin	<u>Turdus migratorius</u>
	Scissor-tailed flycatcher	<u>Tyrannus forficatus</u>
Woodpeckers	Acorn	<u>Melanerpes formicivorus</u>
	Pileated	<u>Dryocopus pileatus</u>

Aquatic species

Anhinga

Anhinga anhinga

Canada goose

Branta canadensis

American coot

Fulica americana

Cormorant

(Double-crested)⁷

Phalacrocorax auritus

Egrets (Ardeidae)⁸

Herons (Ardeidae)⁹

Great-blue heron Ardea herodias

Pelicans¹⁰

Shorebirds

(Many diverse species)

Charadriiformes

Terns

Sterna spp., Chlidonias

niger

¹The two most abundant species generally involved in gull problems are the ring-billed gull (nationwide), and the California gull (west).

²Other species of blackbirds include:

Brewer's blackbird

Euphagus cyanocephalus

Yellow-headed blackbird

Xanthocephalus

xanthocephalus

Rusty blackbird

Euphagus carolinus

Tricolored blackbird (California,
Oregon)

Agelaius tricolor

Boat-tailed grackle

(Florida, coastal southeast)

Quiscalus major

Great-tailed grackle (southwest)

Quiscalus mexicanus

Bronzed cowbird (local, extreme
southwest)

Molothrus aeneus

³Only mud nest builders are considered.

⁴Other crows:

Fish crow (southeast, especially near Atlantic and Gulf Coasts)	<u>Corvus ossifragus</u>
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Northwestern crow (extreme northwest along coast)	<u>Corvus caurinus</u>
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⁵Other ravens:

Chihuahuan raven (south near Mexican border)	<u>Corvus cryptoleucus</u>
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⁶Vultures:

Turkey vulture (nationwide)	<u>Cathartes aura</u>
Black vulture (mainly southeast)	<u>Coragyps atratus</u>

⁷Six species of cormorants occur in the United States. The double-crested cormorant is by far the most common and most widely distributed species and the only one found in the southeast.

⁸Four species, only three common:

Great egret	<u>Casmerodius albus</u>
Snowy egret	<u>Egretta thula</u>
Cattle egret	<u>Bubulcus ibis</u>

⁹Seven other species of herons are common:

Green heron	<u>Butorides striatus</u>
Little blue heron	<u>Egretta caerulea</u>
Louisiana heron	<u>Egretta tricolor</u>
Black-crowned night heron	<u>Nycticorax nycticorax</u>
Yellow-crowned night heron	<u>Nycticorax violaceus</u>
American bittern	<u>Botaurus lentiginosus</u>
Least bittern	<u>Ixobrychus exilis</u>

¹⁰Pelicans:

Brown (Atlantic and Pacific coasts)	<u>Pelecanus occidentalis</u>
American White (inland and coastal)	<u>Pelecanus erythrorhynchos</u>

APPENDIX C: PROBLEMS ATTRIBUTED TO MISCELLANEOUS TERRESTRIAL
AND AQUATIC BIRD SPECIES (VALUES ARE NUMBER OF OCCURRENCES)

[illegible]

APPENDIX D: DISTRICT AND PROJECT CONTACTS
AND A SUMMARY OF THEIR BIRD PROBLEMS

District	Project*	Contact	Phone	Bird Pests	Problem Site	Severity
Albuquerque	John Martin	Malcolm Huckleberry Mark Stark, Russ Smith	(FTS)8-474-1294 (303)336-3476	Cliff swallows	Dam	Moderate
Baltimore	Sayers	Ken Downy Bert Smith Bud Gundlach	(FTS)8-922-4886 (717)962-2078 (717)962-2500	Swallows Pigeons Swallows	Dam & Gates Dam & Bridges Bridges	Mild Moderate Mild
	Bloomington Lake Curruensville Indian Rock	Smith Gundlach Ron Bryden Bill Kirtpatrick	(814)236-2000 (717)792-0312	Swallows & pigeons Pigeons	Dam Gates	Mild Moderate
Detroit	St. Mary's Falls Canal	Howard Lawson Stanley Jacek	(906)632-3311 (FTS)8-226-6797	Pigeons, gulls Canada geese	Dam Dam	Moderate Mild
Jacksonville		Gerald Atmar	(FTS)8-946-2615	Aquatic species		Mild
Little Rock		Clyde Gates	(FTS)8-740-5675	Pigeons, sparrows	Dams	Mild
Louisville	Lock & Dam #52 Huntington Lake Smithland Lake McAlpine Lake Markland Lake	Larry Dickson Truman Emerson John Updike Wayne Kelly Fred Bennett	(FTS)8-352-5613 (618)564-3151 (219)782-2181 (618)564-2315 (502)774-3514	Starlings & sparrows Pigeons Pigeons Pigeons Starlings	Buildings Cable houses TaInter Gates	Severe Moderate Solved Solved Contract out
Mobile	Jim Moodruff Andrews Walter P. George	Alton Colvin " "	(904)785-5881 " "	Pigeons & gulls Pigeons & gulls Gulls	Dam Dam Dam	Moderate Moderate Moderate
Nashville	Cheatham Cordell Hull Dale Hollow Lake	Avis Kennedy and Bill Carter Mike Patterson Tom Mabrey, Jack Zied Jim Hunter	(615)736-5115 (615)792-5697 (615)735-2244 (615)243-3136	Pigeons, swallows, Starlings & sparrows Canada geese Starlings Pigeons	Lock & Dam Public use areas Buildings Dam	Mild Severe Moderate Solved
New England Division	Westville Lake	Libby Horkins	(FTS)8-839-7283	Canada geese	Public use areas	Mild

*When no specific project is cited, the contact represents the District Office.

District	Project	Contact	Phone	Bird Pests	Problem Site	Severity
Omaha		Steve Earl Environmental Office	(FTS)8-864-4575 (FTS)8-864-4598			No Problems
Philadelphia	Blue Marsh Lake Chesapeake City	Roy Denmark, Jr. John Fortten Jim Tomlin	(FTS)8-597-4833 (FTS)8-597-6820 (301)885-5622 or (301)885-5621	Pigeons Pigeons	Towers Four Bridges	Moderate Severe
*Pittsburgh	Emsworth Pike Island	Al Zupon Holly Murray, Michael Fowles	(FTS)8-722-6800 (412)639-9013 "	Pigeons "	Dams & bridges "	50% of Projects No Problems Moderate "
Portland	Cottage Grove Lake	Kathy Kinney Geof Dorsey Carolyn Zarnekee	(503)221-6482 (503)221-6868	Canada geese, Pigeons & cliff swallows	Various	Mild
Rock Island		Jon Duyvejonck	(309)788-6361 x308	Pigeons	Pier houses	Moderate
Sacramento			(FTS)8-448-2232	Sparrows, swallows	Various	Mild
Savannah		Dale Coleman	(FTS)8-248-5792	Pigeons, Starlings, Sparrows, Gulls, Blackbirds	Various	Mild
St. Paul		Tom Okaness	(612)725-7563	Swallows, pigeons		Mild
Tulsa		Susan Couch	(FTS)8-745-7356	Gulls, starlings, sparrows, blackbirds	Various	Mild
Walla Walla	McNary	Paul Winborg Pete Gibson	(FTS)8-434-6506 (503)922-3211	Starlings, pigeons	Power house dam	Severe Solved

*Nine other projects have additionally reported problems with pigeons and starlings.

APPENDIX E: PROJECTS HAVING THE MOST SERIOUS
AND REPRESENTATIVE BIRD PEST PROBLEMS

Species*	Project	District	Location	Problem Site	Time of Year	Contact	Telephone
Cliff Swallows	John Martin	Albuquerque	Hasty, CO	Dam complex	End March-May	Mark Stark	303-336-3476
Starlings (E)	McNary	Walla Walla		Dam-power House complex roost	Oct.-April	Pete Gibson	503-922-3211
Starlings (N&E)	Dale Hollow Lake	Nashville	North Central Tennessee	Warehouse, boathouse	Spring-summer	Jim Hunter	615-243-3136
Starlings/Sparrows (N&E)	Lock & Dam #52	Louisville	Brookspport, IL Ohio River	Large building	Spring-summer	Truman Emerson	618-564-3151
Starlings/Sparrows (N&E)	Cheatham	Nashville	120 miles from Dale Hollow	Lock & dam, esp. gates	Spring-summer	Mike Patterson	615-792-5697
Gulls (E)	St. Mary's Falls Canal	Detroit		Dam area	Summer	Howard Lawson	906-632-3311
Gulls (E)	1. Jim Woodruff 2. Andrews 3. Walter P. George	Mobile		Dam complex	Winter	Alton Colvin	904-785-5881
Canada Geese (E)	Cordell Hull	Nashville	40 miles from Dale Hollow	Public use areas	Summer	Tom Mabry Jack Zied	615-735-2244
Pigeons (mainly excrement but also nests)	Huntington Lake	Louisville	Huntington IN	Cable houses	All year but mainly summer	John Updike	219-782-2181
	Chesapeake City	Philadelphia	Chesapeake City, MD	Bridges		John Forren	FTS 597-6820
						Jim Tomlin	301-885-5622 5621
	1. Jim Woodruff 2. Andrews	Mobile		Dam complex		Alton Colvin	904-785-5881
	Dale Hollow Lake	Nashville		Dam power house			
	Sayer's	Baltimore		Dam complex		Bert Smith Bud Gunolach	717-962-2078 717-962-2500
	St. Mary's Falls Canal	Detroit		Dam complex		Howard Lawson	906-632-3311
	Ensworth	Pittsburgh	PGH. EMS	Dam complex & bridges		Holly Murray	412-639-9013
	Pike Island		Wheeling, WV				

*E = excrement; N = nests.

APPENDIX F: ADDRESSES OF BIRD DAMAGE CONTROL EXPERTS
WHO REVIEWED CIVIL WORKS BIRD PROBLEMS

ANIMAL DAMAGE CONTROL, U.S. DEPARTMENT OF AGRICULTURE

Dr. David L. Otis, Acting Chief
Section of Bird Damage Control
Denver Wildlife Research Center
Building 16, Denver Federal Center
P.O. Box 25266
Denver, CO 80225-0266
(303) 236-7858
FTS 8-776-7858

Dr. Donald F. Mott, Project Leader
Denver Wildlife Research Center
Kentucky Research Station
334 15th St.
Bowling Green, KY 42101
(502) 842-0341

Dr. C. Edward Knittle
Section of Bird Damage Control
Denver Wildlife Research Center
Building 16, Denver Federal Center
P.O. Box 25266
Denver, CO 80225-0266

Dr. Paul W. Lefebvre
Animal Damage Control Research
2820 East University Ave.
Gainesville, FL 32601

Dr. Paul P. Woronecki
Denver Wildlife Research Center
Ohio Field Station
Sandusky, OH 44870

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