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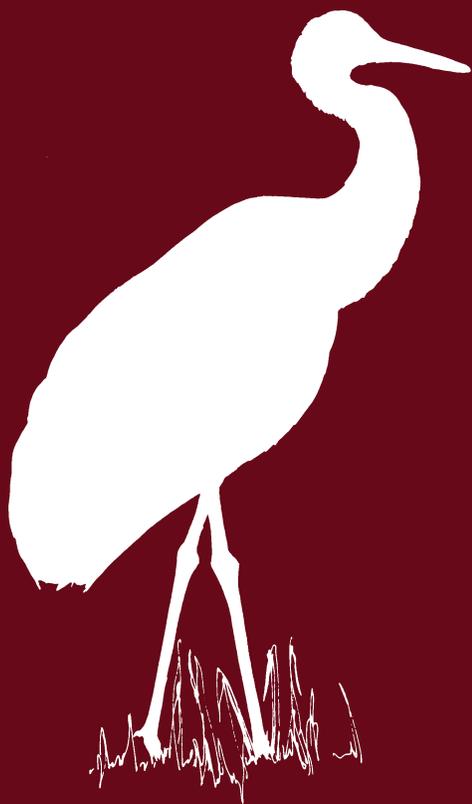
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U.S. Department of the Interior
U.S. Geological Survey

Field Manual of Wildlife Diseases

General Field Procedures and Diseases of Birds



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Field Manual of Wildlife Diseases

General Field Procedures and Diseases of Birds

Biological Resources Division
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Dedication

We dedicate this Manual to the countless field biologists within the U.S. Fish and Wildlife Service and the State wildlife agencies with whom we have had the privilege of working for nearly a quarter-century. Their endless assistance and devotion to the conservation of our Nation's wildlife resources has stimulated our own efforts to address wildlife health issues and made those efforts more rewarding than we originally believed was possible. We thank you for your efforts and hope that the material provided within these pages will be useful to you in the days ahead.

Milton Friend and J. Christian Franson



Photo by Michael Samuel

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Foreword

DO WILDLIFE DISEASES REALLY MATTER? The waterfowl manager who wakes up one morning to find ten thousand dead and dying birds in the marsh would think so. Yet virtually every wild bird and mammal harbors at least a few parasites seemingly without obvious adverse consequences. Parasites, viruses, bacteria, and fungi are component parts of the ecosystems in which wildlife are found, but do not necessarily cause disease. Millennia of coevolution have engendered a *modus vivendi* that assures the survival of both host and parasite populations.

Then why the ten thousand sick and dying birds? Ecosystems are changing. Waterfowl are concentrated on shrinking wetlands and remain there for longer periods of time, facilitating bird-to-bird spread of the bacteria that cause avian cholera. Or permitting the buildup of parasites in their hosts from a small, relatively benign number to massive numbers that cause disease and death. Water quality of wetlands changes, favoring the production of deadly botulinum toxin by bacteria and its mobilization up the food chain to waterfowl. New, totally artificial habitats are created with unpredictable results. The extreme temperature, salinity, and other conditions of the Salton Sea have created an unusual ecosystem in which botulism occurs in fish and in birds through biological cycles that are not yet understood. Wetland loss in southern California leaves few alternative places for waterbirds to go, so they are attracted to the Salton Sea.

Behavior changes. Mallard ducks take up residence on the ponds and lakes of city parks and lose their migratory habits. They share these bodies of water with exotic species, such as Muscovy ducks that have also taken up residence there after introduction by people, setting the scene for outbreaks of duck plague, and creating the risk of spread to migratory waterfowl that also use these areas. Raccoons and skunks become well adapted to urban life, bringing rabies and canine distemper with them into the city.

The environment changes the physiology of wild animals. Human activity introduces into wildlife habitats chemical compounds that adversely affect physiological processes such as reproduction and immune responsiveness. These compounds become incorporated into the ecosystems, often becoming more concentrated as they move up food chains. Their effects can influence wildlife populations. Some of these endocrine-disrupting chemicals, such as chlorinated hydrocarbons (DDE, PCBs), interfere with normal endocrine function by mimicking natural hormones, with resulting eggshell thinning and breakage. Effects of these chemical compounds on immune-system responses to infectious and parasitic agents are less well understood.

What to do? Incorporating disease-prevention measures into wildlife management practices requires more information than is usually available. The information-gathering process must begin in the field. Field biologists must monitor disease occurrence. This Field Manual is a valuable aid in identifying the diseases that are likely to be present, and in giving guidance on the gathering and treatment of specimens needed to establish the diagnosis in the laboratory.

But the wildlife field biologist is in a position to provide valuable information that goes beyond the collection of samples from sick and dead individuals. Although diseased individuals are the basic unit of surveillance, the occurrence of disease must be put into ecological perspective. A careful description of the ecological setting in which the disease is occurring, and any changes that have occurred over time, are ultimately as important as a careful description of the lesions observed in the individual, if the epidemiology of that disease is to be understood, and the disease prevented through sound wildlife-management practices.

It is my hope that the awareness of diseases affecting wildlife and the good disease-surveillance practices promoted by this manual will spread throughout the range of the species we are trying to manage and protect. We must know more than we do currently about disease occurrence throughout the ranges that the wildlife occupy. Many migratory species know nothing of international boundaries. Neither do their diseases. Until we have a much more complete picture of the disease-environment relationships of the blue-winged teal from its nesting ground in Canada, its migration route through the United States and overwintering areas in Central America or the Cienaga Grande de Santa Marta in Columbia, sound disease-prevention management of that species will not be possible. Similar considerations exist for other species.



*Thomas M. Yuill
Madison, Wisconsin
May, 1999*



Photo by J.Christian Franson

“Ingenuity, knowledge, and organization alter but cannot cancel humanities vulnerability to invasion by parasitic forms of life. Infectious diseases which antedated the emergence of humankind will last as long as humanity itself, and will surely remain, as has been hitherto, one of the fundamental parameters and determinants of human history.”

(McNeill)

Introduction

“When one comes into a city in which he is a stranger, he ought to consider its situation, how it lies as to the winds and the rising of the sun; for its influence is not the same whether it lies to the north or to the south, to the rising or to the setting sun. These things one ought to consider most attentively, and concerning the waters which the inhabitants use, whether they be marshy and soft, or hard and running from elevated and rocky situations, and then if saltish and unfit for cooking; and the ground, whether it be naked and deficient in water, or wooded and well-watered, and whether it lies in a hollow, confined situation, or is elevated and cold ... From these things he must proceed to investigate everything else. For if one knows all these things well, or at least the greater part of them, he cannot miss knowing, when he comes into a strange city, either the diseases peculiar to the place, or the particular nature of the common diseases, so that he will not be in doubt as to the treatment of the diseases, or commit mistakes, as is likely to be the case provided one had not previously considered these matters. And in particular, as the season and year advances, he can tell what epidemic disease will attack the city, either in the summer or the winter, and what each individual will be in danger of experiencing from the change of regimen.”

—Hippocrates, *On Airs, Water, and Places*, c. 400 B.C.

I was first employed in the field of wildlife conservation in 1956 as an assistant waterfowl biologist. Had I decided then to join some of my colleagues in preparing a manual about the diseases of wild birds similar to this publication, the task would have been much simpler. The number of chapters needed would have been far less because some of the diseases described in this Manual were not yet known to exist in free-ranging North American birds or, if they were known, they were not considered to be of much importance. This is especially true for diseases caused by viruses; also, organophosphorus and carbamate pesticides had not come into wide use. These types of differences are evident between this *Field Manual of Wildlife Disease — General Field Procedures and Diseases of Birds* and the *Field Guide to Wildlife Diseases — General Field Procedures and Diseases of Migratory Birds* that was published little more than a decade ago. The current Manual reflects both expanded knowledge about avian diseases and an increase in both the occurrence of disease in wild birds and the variety of agents responsible for illness and death of wild birds.

Landscape changes and environmental conditions that are related to them are a major factor associated with disease occurrence in wild birds. The direct association between environment and human health has been recognized since

ancient times and was aptly stated by Louis Pasteur, “The microbe is nothing; the terrain everything.” Despite this well documented relationship, which serves as a basic foundation for addressing many human and domestic animal diseases, there has been little consideration of “the terrain” as a factor for diseases of wild birds. We must learn to “read the terrain” in a manner similar to the teaching of Hippocrates and apply that knowledge to disease prevention or else the next edition of this Manual a decade from now will likely include another major expansion in the number of diseases being addressed.

Although this Manual is much larger than the 1987 *General Field Procedures and Diseases of Migratory Birds* the basic format and “terrain” approach of the previous publication were retained because of the positive comments that were received from its users. The format, the photographs previously used, and most of Section 1, General Field Procedures, have been basically retained, but the text for chapters about individual diseases (Sections 2 through 8) has been extensively reworked. This Manual also has separate sections that address biotoxins and chemical toxins in addition to major expansion of the number of individual diseases within the sections on bacterial, fungal, viral, and parasitic diseases. The presentations in the various sections have

Facing page quote from:

McNeill, W.H., 1976, *Plagues and peoples*: Anchor Press/
Doubleday, Garden City, N.Y., p. 291

been supplemented with introductory comments regarding the subject area, and most sections have been highlighted with descriptions of miscellaneous disease conditions that may interest users and readers.

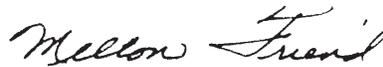
As with the 1987 publication, the focus of this Manual is on conveying practical information and insights about the diseases in a manner that will help National Wildlife Refuge managers and other field personnel address wildlife health issues at the field level. The information represents a composite of our understanding of the scientific literature, of our personal experiences with and investigations of the various diseases, and of information generously provided by our colleagues within the wildlife disease and related fields. In presenting this information, we have borrowed freely from all of those sources. Because this is a synoptic field manual and not a textbook, literature citations are not provided in support of statements. Only a small portion of the specific literature that is the basis for the statements has been listed, and the supplementary reading lists are intended to provide entry into the scientific literature for more precise evaluation of specific topics.

The need to generalize and, thus, provide a practical overview of complex biological situations often results in a loss of precision for some information. We have attempted to provide detail where it is of significant importance and have been more general elsewhere. In all cases, we have attempted to represent the information objectively and accurately. For example, Appendix E presents specific brain cholinesterase values that are supported by laboratory data for different bird species to provide a baseline against which others can make judgements about mortality due to organophosphorus and carbamate pesticides. In contrast, representation of the geographic distribution, frequency of occurrence, and species susceptibility associated with specific diseases is of a general nature and is intended only for gross comparison. The differences in these representations of general information between the 1987 publication and this Manual are both a positive and a negative outcome of the last decade. These differences reflect enhanced information about disease in wild birds as a result of expanded study (a positive outcome), changes in disease patterns (a negative outcome due to expansion of disease), and both, depending on the disease.

Current understanding about wild bird diseases is being provided by those with technical knowledge about disease

processes to those with technical knowledge and stewardship and conservation of our wild bird resources. Common language has been used whenever possible to aid in this communication and to stimulate greater interest in wildlife disease among others who may wish to read this Manual but who may not be familiar with some of the terms. Technical terms have been translated in a manner that we hope will be useful for readers as they pursue additional subject matter detail in the scientific literature. Technical terms have also been inserted into the text and defined where they provide value-added precision for the statements. It is my personal hope that a decade from now, when consideration is being given to a revision of this Manual, that a great deal of the preparation of the revision will be done by wildlife biologists who have become practitioners in the art of disease prevention and control because of an enhanced understanding of disease ecology that we have all gained through our collective efforts. The transition hoped for is no greater than other changes that have taken place since the 1987 publication of the original Field Guide. At that time, the National Wildlife Health Center (NWHC) was part of the Department of the Interior, U.S. Fish and Wildlife Service. Since then, the Center has become part of the Department of the Interior, U.S. Geological Survey, Biological Resources Division.

My professional situation has also changed. Those familiar with the 1987 publication will note that I was Director of the NWHC when that publication became available. In December 1997, Secretary of the Interior Bruce Babbitt asked me to accept the challenge of coordinating the science efforts that will aid and guide decisions for management actions to improve the health of the Salton Sea, California's largest inland body of water. Recurring major disease events involving migratory birds at the Sea since 1994 have focused public attention on it. These disease events became a catalyst for the expansion of efforts to improve the environmental quality of the Sea, and in June 1998, a combined National Environmental Policy Act (NEPA)/California Environmental Quality Act (CEQA) process was initiated to pursue attainment of that goal. I officially became part of the multiagency effort to "Save the Salton Sea" with my reassignment in April 1998 from Director of the NWHC to Executive Director, Salton Sea Science Subcommittee.



Milton Friend

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