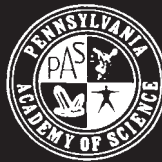


# AVIAN ECOLOGY AND CONSERVATION



**A Pennsylvania Focus  
with  
National Implications**



---

**A publication of the Pennsylvania Academy of Science**

**Shyamal K. Majumdar**

**Terry L. Master, Margaret C. Brittingham, Robert M. Ross  
Robert S. Mulvihill and Jane E. Huffman  
Editors**

**Pennsylvania Avian Ecology and Conservation:  
A Pennsylvania Focus with National Implications**

The intent of Avian Ecology and Conservation: A Pennsylvania Focus with National Implications is to compile recent ornithological research conducted primarily by Pennsylvania ornithologists, wildlife managers and conservation biologists that has important implications for Pennsylvania's avifauna but application far beyond its borders. There are many popular books and field identification guides on the state's birds, a second breeding bird atlas volume will soon be published as will a volume on the conservation status of Pennsylvania birds and other vertebrates, and an excellent book on the life histories of Pennsylvania birds exists but never a volume summarizing the highlights of scientific research being conducted on birds within the state. The book is divided into sections including; (1) an introductory historical perspective of Pennsylvania's contribution to ornithological study by Pulitzer Prize nominated author Scott Weidensaul; (2) Breeding Birds and their Habitats; (3) Migration and Wintering Ecology; (4) Conservation Issues and Challenges and; (5) Emerging Issues and their Impacts on Birds. Taken together, the chapters provide an overview of the work of a multitude of ornithologists working within the state at academic institutions, non-governmental organizations and state wildlife and conservation agencies. These institutions will obviously find the book very useful but it is also intended for anyone with a keen interest in the ecology, behavior and conservation of Pennsylvania's birds.

ISBN: 0-945809-20-4, 368 pages, 27 Chapters

\$70.00 ea, plus \$5.00 Postage and Handling. (Pennsylvania residents, please add 6% sales tax) Nonprofit organization please indicate Tax Exempt Number.

Check payable to:

**The Pennsylvania Academy of Science**  
c/o Dr. S.K. Majumdar, Editor  
Department of Biology  
Lafayette College  
Easton, Pa 18042

# Avian Ecology and Conservation: A Pennsylvania Focus with National Implications

## Table of Contents

|   |      |
|---|------|
| <b>Preface</b> .....  | v    |
| <b>Acknowledgment</b> .....   | vi   |
| <b>Foreword</b>   |      |
| <i>Michael DiBerardinis, Secretary, Pennsylvania Department of Conservation and Natural Resources, Harrisburg, PA 17101</i> .....   | xi   |
| <b>Message:</b> <i>Carl G. Roe, Executive Director, Pennsylvania Game Commission, Harrisburg, PA</i> .....  | xiii |
| <b>Introduction: Historical Overview of Pennsylvania Ornithology</b>  |      |
| <i>Scott Weidensaul, Author and Naturalist, 778 Swartz Valley Road, Schuylkill Haven, PA 17972</i> .....  | 1    |
| <b>SECTION I. Breeding Birds of Pennsylvania and Their Habitats</b>   |      |
| <b>SECTION OVERVIEW</b>   |      |
| <i>Terry L. Master, Department of Biological Sciences, East Stroudsburg University of Pennsylvania, 200 Prospect St., East Stroudsburg, PA 18301</i> .....  | 12   |
| <b>CHAPTER 1: BREEDING BIRDS OF PENNSYLVANIA: FOREST COMMUNITIES</b>  |      |
| <i>Scott H. Stoleson, USDA Forest Service, Northern Research Station P.O. Box 267, Irvine, PA 16329 and Jeffery L. Larkin, Department of Biology Indiana University of Pennsylvania, 126 Weyandt Hall, Department of Biology, Indiana, PA 15705-1081</i> .....                                      | 14   |
| <b>CHAPTER 2: AVIAN-MEDIATED SEED DISPERSAL: AN OVERVIEW AND SYNTHESIS WITH AN EMPHASIS ON TEMPERATE FORESTS OF CENTRAL AND EASTERN US</b>  |      |
| <i>Michael A. Steele, Department of Biology and Health Sciences, 84 West South St., Wilkes University, Wilkes-Barre, PA 18766, Nathanael Lichti and Robert K. Swihart, Department of Forestry and Natural Resources, Purdue University, 715 W State Street, West Lafayette, IN 47907-2033</i> ..... | 28   |
| <b>CHAPTER 3: WETLAND BIRD COMMUNITIES: BOREAL BOGS TO OPEN WATER</b>   |      |
| <i>Douglas A. Gross, Wildlife Biologist and Catherine D. Haffner, Colonial Waterbird Survey Commission, Pennsylvania Game Commission, 2001 Elmerton Ave., Harrisburg, PA 17110-4250</i> .....   | 44   |
| <b>CHAPTER 4: AVIAN COMMUNITY CHARACTERISTICS AND RIPARIAN HABITAT</b>  |      |
| <i>Terry L. Master, Department of Biological Sciences, East Stroudsburg University of Pennsylvania, 200 Prospect St., East Stroudsburg, PA 18301-2999</i> .....   | 62   |
| <b>CHAPTER 5: EARLY SUCCESSIONAL AND SHRUBLAND COMMUNITIES, WITH SPECIAL REFERENCE TO FIELD SPARROW (<i>SPIZELLA PUSILLA</i>) BREEDING BIOLOGY</b>  |      |
| <i>Michael D. Carey, Department of Biology, University of Scranton, Scranton, PA 18510-4623</i> .....   | 75   |

# Avian Ecology and Conservation: A Pennsylvania Focus with National Implications

## CHAPTER 6: RECLAIMED SURFACE MINE HABITAT AND GRASSLAND BIRD POPULATIONS

*Glenn E. Stauffer, School of Forest Resources, 422 Forest Resource Bldg., Penn State University, University Park, PA 16802; Matthew R. Marshall, National Park Service, University Park, PA 16802; Duane R. Diefenbach, USGS, Pennsylvania Cooperative Fish and Wildlife Research Unit, University Park, PA 16802 and Daniel W. Brauning, Pennsylvania Game Commission, 2001 Elmerton Ave., Harrisburg, PA 17110-4250.....86*

## SECTION II. Migration and Wintering Ecology

### SECTION OVERVIEW

*Paul Hess, Pennsylvania Ornithological Records Committee, 1412 Hawthorne St., Natrona Heights, PA 15065-1629.....97*

### CHAPTER 7: DIURNAL RAPTOR MIGRATION

*Keith Bildstein, Sarkis Acopian Director of Conservation Science, Hawk Mountain Sanctuary, 1700 Hawk Mountain Road, Kempton, PA 19529 .....99*

### CHAPTER 8: GOLDEN EAGLE MIGRATION AND WINTER BEHAVIOR IN PENNSYLVANIA

*Trish A. Miller, Carnegie Museum of Natural History, Powdermill Nature Reserve, 1847 Route 381, Rector, PA 15677, D. Brandes, Dept of Civil & Environmental Engineering, Acopian Engineering Center, Lafayette College, Easton, PA 18042, Michael J. Lanzone, Carnegie Museum of Natural History, Powdermill Nature Reserve, 1847 Route 381, Rector, PA 15677, D. Ombalski, Tussey Mountain Hawk Watch, Mulberry Street, Unionville, PA 16844, C. Maisonneuve, Ministere des Ressources naturelles et de la Faune, 92 2e rue Ouest, Rimouski, QC G5L 8B3, Canada, Todd E. Katzner, Department of Conservation and Field Research, National Aviary, 700 Arch St., Allegheny Commons West, Pittsburgh, PA 15212.....111*

### CHAPTER 9: WINTER RAPTOR SURVEY

*Gregory W. Grove, State College Bird Club, 4343 McAlevys Fort Road, Petersburg, PA 16669.....126*

### CHAPTER 10: MIGRATION AND WINTERING ECOLOGY OF SAW-WHET OWL

*Scott Weidensaul, Author and Naturalist, 778 Swartz Valley Road, Schuylkill Haven, PA 17972.....137*

### CHAPTER 11: BIRD DISTRIBUTIONS IN THE CHRISTMAS BIRD COUNT

*Nick C. Bolgiano, State College Bird Club, 711 W. Foster Avenue, State College, PA 16801 .....148*

### CHAPTER 12: STOPOVER ECOLOGY OF LANDBIRD MIGRANTS IN PENNSYLVANIA

*Robert J. Smith and Margret I. Hatch, Department of Biology, University of Scranton, Scranton, PA 18510-4623 .....161*

### CHAPTER 13: USE OF GENETIC MARKERS AND STABLE ISOTOPE TECHNOLOGY TO DETERMINE MIGRATORY AND DISPERSAL PATTERNS AND GEOGRAPHIC VARIATIONS IN AVIAN POPULATIONS

*Fred Brenner, Grove City College, Grove City, PA 16127, Christina A. Genarea, Grove City College, Grove City, PA 16127 and Shawn M. Rummel, School of Forest Resources, 136 Land and Water Resources Building, Penn State University, University Park, PA 16802 .....175*

## SECTION III. Conservation Issues and Challenges

### SECTION OVERVIEW

*Margaret C. Brittingham, School of Forest Resources, 409 Forest Resource Bldg., Penn State University, University Park, PA 16802 .....188*

CHAPTER 14: MANAGEMENT AND RECOVERY OF THREATENED AND ENDANGERED BIRD SPECIES  
*Daniel W. Brauning, Pennsylvania Game Commission, 2001 Elmerton Ave., Harrisburg, PA 17110 and Jerry D. Hassinger, 105 Adams Lane, Millersburg, PA 17061* .....191

CHAPTER 15: HABITAT FRAGMENTATION: A THREAT TO PENNSYLVANIA'S FOREST BIRDS  
*Margaret C. Brittingham, School of Forest Resources, 409 Forest Resource Bldg., Penn State University, University Park, PA 16802 and Laurie J. Goodrich, Acopian Center for Conservation Learning, Hawk Mountain Sanctuary, 410 Summer Valley Road, Orwigsburg, PA 17961* .....204

CHAPTER 16: THE STATUS AND CONSERVATION OF FARMLAND BIRDS IN PENNSYLVANIA  
*Andrew M. Wilson, School of Forest Resources, 414 Forest Resources Bldg., Penn State University, University Park, PA 16802* .....217

CHAPTER 17: EASTERN HEMLOCK DECLINE AND ITS EFFECTS ON PENNSYLVANIA'S BIRDS  
*Michael C. Allen, Department of Biological Sciences, East Stroudsburg University, 200 Prospect St., East Stroudsburg, PA 18301 and James Sheehan, Jr., Division of Forestry and Natural Resources, West Virginia University, Morgantown, WV 26506-6125* .....232

CHAPTER 18: THE LOUISIANA WATERTHRUSH AS AN INDICATOR OF HEADWATER STREAM QUALITY IN PENNSYLVANIA  
*Steven C. Latta, Department of Conservation and Field Research, National Aviary, 700 Arch St., Allegheny Commons West, Pittsburgh, PA 15212 and Robert S. Mulvihill, Carnegie Museum of Natural History, Powdermill Avian Research Center, 1847 Route 381, Rector, PA 15677* .....246

CHAPTER 19: COLONIALY NESTING WADERS  
*Robert M. Ross, Ecologist, Northern Appalachian Research Laboratory, United States Geological Survey (retired), 146 Cattail Lane, Wellsboro, PA 16901* .....259

**CHAPTER 20: SHEET GLASS AS A PRINCIPAL HUMAN-ASSOCIATED AVIAN MORTALITY FACTOR**  
*Daniel Klem, Acopian Center for Ornithology, Biology Department, Muhlenberg College, 2400 Chew St., Allentown, PA 18104-5586* .....276

**SECTION IV: Emerging Issues and their Impacts on Birds**

SECTION OVERVIEW  
*Shyamal K. Majumdar and Ioana A. Marin, Department of Biology, Lafayette College, Easton, PA 18042* .....290

CHAPTER 21: GLOBAL CLIMATE CHANGE: CONSERVATION CHALLENGES AND IMPACTS ON BIRDS  
*Terry L. Root, Woods Institute for the Environment, 473 Via Ortega Drive, Stanford University, Stanford, CA 94305 and Elizabeth S. Goldsmith, Stanford University School of Medicine, 300 Pasteur Drive, MSOB X3C01, Stanford, CA 94304* .....292

CHAPTER 22: WIND POWER MORTALITY  
*D. Brandes, Dept of Civil & Environmental Engineering, Acopian Engineering Center, Lafayette College, Easton, PA 18042, Trish A. Miller, Carnegie Museum of Natural History, Powdermill Nature Reserve, 1847 Route 381, Rector, PA 15677, Todd E. Katzner, National Aviary, 700 Arch St., Allegheny Commons West, Pittsburgh, PA 15212* .....300

# Avian Ecology and Conservation: A Pennsylvania Focus with National Implications

|   |     |
|---|-----|
| CHAPTER 23: EPIZOOTIOLOGY OF WEST NILE VIRUS IN WILD BIRDS<br><i>Jennifer C. Owen, Department of Fisheries and Wildlife, Michigan State University,<br/>13 Natural Resources, East Lansing, MI 48824 and Mary Garvin, Science Center K123,<br/>Oberlin College, 119 Woodland St., Oberlin, OH, 44074-1097</i> .....                                     | 304 |
| CHAPTER 24: WEST NILE VIRUS IN RAPTORS<br><i>Jane E. Huffman, Department of Biological Sciences, East Stroudsburg University of<br/>Pennsylvania, East Stroudsburg, PA 18301-2999, and Douglas E. Roscoe, NJ Division<br/>of Fish and Wildlife, Office of Fish and Wildlife Health and Forensics, 141 Van Syckels<br/>Road, Hampton, NJ 08827</i> ..... | 315 |
| CHAPTER 25: AVIAN INFLUENZA IN BIRDS: DISEASE TRANSMISSION,<br>SPREAD, AND ECONOMICAL IMPACTS<br><i>Aviva Goel, Michael Favara, and Shyamal K. Majumdar, Department of Biology,<br/>Lafayette College, Easton, PA 18042</i> .....   | 323 |
| CHAPTER 26: IMPACTS OF ENVIRONMENTAL CONTAMINATION ON BIRD<br>POPULATION ECOLOGY<br><i>Nancy M. Waters, Department of Biology, Lafayette College, Easton, PA 18042</i> .....  | 332 |
| CHAPTER 27: THE EFFECTS OF ENVIRONMENTAL CONTAMINANTS ON<br>AVIAN POPULATIONS<br><i>Jeffrey A. Stratford, Department of Biology and Health Sciences, Wilkes University,<br/>84 West South Street, Wilkes-Barre, PA 18766</i> .....  | 340 |
| Subject Index .....   |     |