University of Nebraska - Lincoln
DigitalCommons@University of Nebraska - Lincoln

Other Publications in Zoonotics and Wildlife Disease

Wildlife Disease and Zoonotics

12-1-1999

Appendices, Glossary, and Index (Field Manual of Wildlife Diseases)

Follow this and additional works at: http://digitalcommons.unl.edu/zoonoticspub

Part of the Veterinary Infectious Diseases Commons

"Appendices, Glossary, and Index (Field Manual of Wildlife Diseases)" (1999). *Other Publications in Zoonotics and Wildlife Disease.* Paper 11.
http://digitalcommons.unl.edu/zoonoticspub/11

This Article is brought to you for free and open access by the Wildlife Disease and Zoonotics at DigitalCommons@University of Nebraska - Lincoln. It has been accepted for inclusion in Other Publications in Zoonotics and Wildlife Disease by an authorized administrator of DigitalCommons@University of Nebraska - Lincoln.

Appendix A

Sample specimen history form

Submitter's name: Affiliation:

Address: Telephone: E-mail:

Date collected:

Method of collection: [found dead, euthanized (describe method) etc.]

Collector's name:

Specific die-off location:

State: County: Latitude/longitude:

Environmental factors: (Record conditions such as storms, precipitation, temperature changes, or other changes that may contribute to stress.)

Disease onset: (The best estimate of when the outbreak started.)

Species affected: (The diversity of species affected may provide clues to the disease involved.)

Age/sex: (Any selective mortality related to age and sex.)

Morbidity/mortality: (Ratio of sick animals to dead animals.)

Known dead: (Actual pickup figures.)

Estimated dead: (Consider removal by scavengers or other means.)

Clinical signs: (Any unusual behavior and physical appearance.)

Population at risk: (Number of animals in the area that could be exposed to the disease.)

Population movement: (Recent changes in the number of animals on the area and their source or destination, if known.)

Problem area description: (Land use, habitat types, and other distinctive features.)

Comments: (Additional information/observations that may be of value such as past occurrences of disease in area.)

Appendix B

Sources of wildlife diagnostic assistance in the United States

Assistance in obtaining a diagnosis of wildlife illness or death is available from a variety of sources. However, it is advisable to make inquiries before the need arises about available services, the estimated response time for completing work, and who to contact when assistance is required.

The following wildlife disease programs can offer information, assistance, and services.

Wildlife Disease Programs

1. U.S. Department of Interior,
   U.S. Geological Survey,
   Biological Resources Division
   National Wildlife Health Center
   6006 Schroeder Road
   Madison, WI 53711
   Telephone (608) 270-2400
   Web site: http://www.emtc.usgs.gov/nwhchome.html

2. State fish and game agencies. Several States have wildlife disease programs. Among those are Alaska, California, Colorado, Florida, Idaho, Michigan, New Jersey, New York, Wisconsin, and Wyoming. Contact the State fish and game agency headquarters to inquire about assistance.

3. Regional wildlife disease programs. Two regional programs are presently affiliated with universities:

   Southeastern Cooperative Wildlife Disease Study
   College of Veterinary Medicine
   University of Georgia
   Athens, GA 30602
   Telephone (706) 542-1741

   Northeastern Research Center for Wildlife Diseases
   University of Connecticut
   Department of Pathobiology
   Storrs, CT 06269-3089
   Telephone (860) 486-4000

4. University programs. Several other universities, for example, the University of Florida—Gainesville and Virginia Polytechnical Institute and State University—Blacksburg, are involved in wildlife disease activities. Inquiries at schools of veterinary medicine and departments of veterinary or animal science at universities throughout the United States will reveal additional sources of wildlife disease diagnostic assistance.

5. Private sector. Some private consultants also deal with wildlife disease problems.

Domestic Animal Disease Programs

1. U.S. Department of Agriculture,
   Animal and Plant Health Inspection Service
   National Veterinary Services Laboratories
   P.O. Box 844, Ames, Iowa 50010
   Telephone (515) 239-8600.

   This facility accepts diagnostic specimens that have been referred to it through appropriate State or Federal channels.

2. State departments of agriculture. Animal disease diagnostic laboratories exist to serve domestic animal needs, but will often accept wildlife specimens.

3. Private sector. Veterinarians in private practice often have both interest and expertise in wildlife diseases and may become involved with these problems.

Additional sources of assistance for investigating wildlife mortality events when chemical toxins are suspected.

Federal Government

U.S. Fish and Wildlife Service (FWS)

The Division of Environmental Contaminants (DEC) is the FWS focal point for issues associated with chemical toxins. Information on contaminants can be obtained from the Central Office in Washington, D.C.

Telephone: (703) 358-2148
Web site: http://www.fws.gov/~r9dec/ecprog.html and from DEC staff in the seven FWS Regional Offices.

DEC biologists are assigned to field offices throughout the FWS Regions. They work on specific contaminant issues in each Region and are available to provide information and assistance regarding mortality event investigations.

Toxic spill coordinators are located in each Regional Office, providing a focal point for response actions.

FWS Regional Offices are located in:
Portland, Ore.; Albuquerque, N. Mex.; Fort Snelling, Minn.; Atlanta, Ga.; Hadley, Mass.; Denver, Colo.; and Anchorage, Alaska.

U.S. Geological Survey, Biological Resources Division (BRD)

The National Wildlife Health Center, which is the BRD Science Center in Madison, Wis., provides information about and assists in investigating wildlife mortality events.

Telephone: (608) 270-2400
Web site: http://www.emtc.usgs.gov/nwhchome.html

Research on chemical toxins is carried out at several BRD Science Centers. Those Centers maintain in-depth technical knowledge regarding the fate and impacts of chemicals in the environment. The Patuxent Wildlife Research Center in Laurel, Md. is an internationally recognized source of information on the effects of contaminants, particularly on avian species.

Telephone: (301) 497-5500
Web site: http://www.pwrc.usgs.gov/

U.S. Environmental Protection Agency (EPA)

Office of Solid Waste and Emergency Response

Telephone: (703) 308-8413
Web site: http://www.epa.gov/epaoswer/

The Office of Pollution Prevention and Toxics (OPPT) assesses the hazards and risks posed by industrial chemicals to human health and the environment. The Environmental Effects Branch in OPPT can provide information on the toxicity of chemicals to aquatic and terrestrial organisms.

Telephone: (202) 260-1268

Office of Pesticide Programs maintains the Ecological Incident Information System, which is a data base on mortality of non-target organisms caused by pesticides.

Telephone: (703) 305-5392

State Government

Many State natural resource agencies have environmental contaminant programs that provide a mechanism to report suspected chemical toxin problems. Some States have groups that investigate mortality events associated with chemicals, and that may be able to provide field assistance and chemical analysis.

Natural resource agencies in several States maintain wildlife health programs, which respond to wildlife mortality events.

State veterinary diagnostic laboratories often have toxicologists on staff who have specific knowledge of toxic problems within the region.

Poison Control Centers

The National Animal Poison Control Center at the University of Illinois College of Veterinary Medicine provides a fee-based service directed to prevention and treatment of adverse effects of chemical exposures in animals. This service is staffed by veterinary health professionals who have access to a wide range of information specific to animal poisoning.

Telephone (800) 548-2423, (900) 680-0000
Web site: http://www.cvm.uiuc.edu/NAPCC/NAPCC.html

The American Association of Poison Control Centers (AAPCC) has certified about 40 regional poison information centers throughout the U.S. that focus on human exposure to chemical toxins. These centers function to provide poison information, telephone management and consultation, collect pertinent data, and deliver professional and public education. The national AAPCC office is in Washington, D.C.
Telephone: (202) 362-7217. A directory of the regional centers is available at Web site: http://www.pitt.edu/~martint/pages/rpiclist.htm

Colleges of Veterinary Medicine

Most colleges of veterinary medicine have toxicology departments staffed with experts in the area of animal toxicology.

Analytical Laboratories

Choosing an analytical laboratory requires attention to methods used, quality assurance/quality control (QA/QC), and cost. Laboratories should be using methods that are appropriate to the analysis required in the matrix (material being analyzed) that is submitted. Minimum quality control data provided by the laboratory should include:

(1) The results of analysis of spiked samples, or recovery. A known amount of the compound being analyzed for is added to the appropriate matrix. The recovery is the amount of the compound that was recovered in the analysis, and it is expressed as a percentage of the amount of compound added.
(2) A replication of results, or an agreement of analyses of duplicate samples.
(3) The results of blank samples, or an absence of the compound being analyzed for in a “clean” sample of the appropriate matrix.
(4) The results of analysis of standard reference samples. A sample with a known quantity of the compound is prepared by an independent laboratory, and this sample is then analyzed by the laboratory being evaluated. Although good QA/QC adds to the expense of analytical work, the alternative may be an incorrect diagnosis.

Some of the analytical laboratories that have been used by the FWS DEC and others include:

For inorganic analyses:

Environmental Trace Substance Laboratory
University of Missouri - Rolla
101 USBM Bldg., 1300 North Bishop Ave.
Rolla, MO 65409-0530
Telephone: (314) 341-6607

Research Triangle Institute
3040 Cornwallis Road, Bldg. 6
Research Triangle Park, NC 27709-2194
Telephone: (919) 541-6896

Geochemical & Environmental Research Group
833 Graham Road
College Station, TX 77845
Telephone: (409) 690-0095

For organic analyses:

Geochemical & Environmental Research Group (see above)

Mississippi State Chemical Laboratory
Mississippi State University
Hand Chemical Lab, Rm 201, Morrill Road
Mississippi State, MS 39762
Telephone: (601) 325-3251

The above listing is not intended to be comprehensive, nor does it constitute endorsement by the Federal government. Rather, it illustrates the diversity of possible sources of assistance. Individual circumstances and events dictate which of these sources will be most useful in specific situations.

Appendix C

Sources of supplies used for collecting, preserving, and shipping specimens

Company	Address and telephone	Item
Scientific Products	319 West Ontario Chicago, IL 60610 Tel: (800)323-4515	Whirl-Pak® bags, formalin, wide-mouth, plastic jars, indelible markers
Curtis Matheson Scientific, Inc.	P.O. Box 1546 Houston, TX 77251 Tel: (713)820-9898	Whirl-Pak® bags, wide-mouth, plastic jars, indelible markers
Fisher Scientific Co.	711 Forbes Ave. Pittsburgh, PA 15219 Tel: (800)766-7000	Whirl-Pak® bags, formalin, indelible markers
Thomas Scientific	P.O. Box 99 Swedesboro, NJ 08095 Tel: (609)467-2000	Whirl-Pak® bags, wide-mouth, plastic jars, indelible markers
VWR Scientific	P.O. Box 66929 O'Hare Amp Chicago, IL 60666 Tel: (800)932-5000	Whirl-Pak® bags, indelible markers
Local hospital and medical supply businesses		Whirl-Pak® bags, wide-mouth, plastic jars
Some pharmacies		formalin
Freund Can Co.	167 W. 84th Street Chicago, IL 60620 Tel: (312)224-4230	metal paint cans with lids
U.S. General Services (gov't agencies only)	GSA Customer Supply Center Administration (GAS) 5619 W. 115th St. Worth, IL 60482 Tel: (800)262-0570	filament strapping tape, plastic bags, indelible markers
GSA Federal Supply Service	1500 E. Bannister Rd. Kansas City, MD 64131 Tel: (816)926-7315	filament strapping tape, plastic bags, indelible markers

Company	Address and telephone	Item
Local hardware, sports, and discount stores		Styrofoam®, shipping coolers, indelible markers, ice packs, filament strapping tape
Polyfoam Packers Corp.	2320-T Foster Avenue Wheeling, IL 60090 Tel: (800)225-7443	biomedical shippers and mailers

Protective clothing, gloves, and disinfectants can also be obtained from many of the sources listed above. The above list is not intended to be comprehensive, nor does it constitute endorsement by the Federal government.

Appendix D

Normal brain cholinesterase activity values

Species	Mean[1]	Standard deviation	Sample size
Avocet, American	19.4	2.9	5
Blackbird, Red-winged	24.5	1.2	5
Bobwhite, Northern	16.3	2.1	7
Brant, Black	14.4	0.8	5
Coot, American	20.5	5.0	12
Cormorant, Double-crested	29.3	2.4	5
Cowbird, Brown-headed	19.7	2.6	5
Crane, Mississippi Sandhill	16.6	2.3	15
Crane, Sandhill	17.5	1.4	8
Crane, Whooping	15.1	1.5	9
Dove, Mourning	22.8	3.3	11
Duck, American Wigeon	10.5	1.0	12
Duck, Blue-winged Teal	19.5	3.6	6
Duck, Green-winged Teal	13.5	2.0	17
Duck, Kola	11.0	1.2	9
Duck, Mallard	11.0	1.6	75
Duck, Muscovy	11.6	3.5	8
Duck, Northern Shoveler	14.7	1.2	5
Duck, Pintail	11.6	1.3	24
Duck, Ruddy	13.4	1.4	8
Duck, Wood	10.2	1.5	9
Eagle, Bald	16.0	2.6	156
Eagle, Golden	16.0	2.2	57
Egret, Common	17.4	1.9	5
Egret, Snowy	25.0	1.3	5
Falcon, Peregrine	18.6	3.2	27
Goldfinch, American	17.8	1.5	10
Goose, Canada	11.9	2.0	36
Goose, Canada (Aleutian)	14.0	3.6	8
Goose, Ross	14.2	2.3	9
Goose, Snow	13.6	2.6	42
Goose, White-fronted	12.1	1.2	9
Grebe, Eared	14.7	1.4	17
Grosbeak, Evening	20.3	3.1	5
Gull, Ring-billed	23.9	6.5	8
Hawk, Red-tailed	17.5	1.4	7
Hawk, Sharp-shinned	21.5	2.0	6
Heron, Black-crowned Night	15.6	3.0	5
Heron, Great Blue	13.3	2.1	8
Loon, Common	17.3	4.4	5
Owl, Great-horned	15.5	2.0	7
Owl, Screech	18.7	1.4	5
Owl, Spotted	14.6	2.0	9

Species	Mean[1]	Standard deviation	Sample size
Parrot, Puerto Rican	19.4	2.0	6
Pelican, American White	13.0	1.3	13
Pelican, Brown	11.2	1.2	16
Sandpiper, Semipalmated	14.1	1.1	5
Siskin, Pine	16.9	2.3	16
Stork, Wood	18.7	4.2	8
Swan, Trumpeter	11.3	1.3	10
Swan, Tundra	11.6	1.7	14
Tern, Least California	44.1	9.1	5
Woodcock, American	16.8	1.1	5
Woodpecker, Red-cockaded	38.4	4.8	5

[1] Cholinesterase activity is expressed as micromoles acetylthiocholine hydrolyzed per minute per gram of wet weight brain tissue (Hill, E.F. and Fleming, W.J., 1982, Environmental toxicology and chemistry 1:27–38).

Milton Smith

Appendix E

Common and scientific names of birds in text

Albatrosses, shearwaters, and petrels (Order Procellariiformes)
- Albatrosses (Family Diomedeidae)
  - Black-footed albatross (*Diomedia nigripes*)
  - Laysan albatross (*Diomedia immutabilis*)
- Shearwaters and petrels (Family Procellariidae)
  - Northern fulmar (*Fulmarus glacialis*)
  - Petrels (*Pterodroma* sp*, Oceanodroma* sp*, Oceanites* sp)
  - Sooty shearwater (*Puffinus griseus*)

Cormorants, pelicans, and tropicbirds (Order Pelecaniformes)
- Cormorants and Shags (Family Phalacrocoracidae)
  - Brandt's cormorant (*Phalacrocorax penicillatus*)
  - Cape cormorant (*Phalacrocorax capensis*)
  - Double-crested cormorant (*Phalacrocorax auritus*)
  - Great cormorant (*Phalacrocorax carbo*)
  - Shags (*Phalacrocorax* sp)
- Gannets and boobies (Family Sulidae)
  - Gannet (*Morus bassanus*)
- Pelicans (Family Pelecanidae)
  - Brown pelican (*Pelecanus occidentalis*)
  - White pelican (*Pelecanus erythrorhynchos*)
- Tropicbirds (Family Phaethontidae)
  - Red-tailed tropicbird (*Phaethon rubricauda*)
  - White-tailed tropicbird (*Phaethon lepturus*)

Cranes, coots, and rails (Order Gruiformes)
- Cranes (Family Gruidae)
  - Brolga crane (*Grus rubicunda*)
  - Common crane (*Grus grus*)
  - Demoiselle crane (*Anthropoides virgo*)
  - East African crowned crane (*Balearica regulorum gibbericeps*)
  - Greater sandhill crane (*Grus canadensis tabida*)
  - Hooded crane (*Grus monacha*)
  - Lesser sandhill crane (*Grus canadensis canadensis*)
  - Manchurian crane (red-crowned crane) (*Grus japonensis*)
  - Mississippi sandhill crane (*Grus canadensis pulla*)
  - Sarus crane (*Grus antigone*)
  - Stanley crane (blue crane) (*Anthropoides paradisea*)
  - White-naped crane (*Grus vipio*)
  - Whooping crane (*Grus americana*)
- Rails, coots, and gallinules (Family Rallidae)
  - American coot (*Fulica americana*)
  - Common moorhen (*Gallinula chloropos*)
  - Sora (*Porzana carolina*)

Emus and ostriches (Order Struthioniformes)
- Emu (Family Casuariidae, *Dromaius novaehollandiae*)
- Ostrich (Family Struthionidae, *Struthio camelus*)

Grebes (Order Podicipediformes, Family Podicipedidae)
- Eared grebe (*Podiceps nigricollis*)
- Western grebe (*Aechmophorus occidentalis*)

- Grouse, quail, and partridges (Order Galliformes, Family Phasianidae)
  - Grouse (Subfamily Tetraoninae)
    - Blue grouse (*Dendragapus obscurus*)
    - Ptarmigan (*Lagopus* sp)
    - Red grouse (*Lagopus lagopus scoticus*)
    - Ruffed grouse (*Bonasa umbellus*)
    - Sage grouse (*Centrocercus urophasianus*)
    - Sharp-tailed grouse (*Tympanuchus phasianellus*)
  - Quail (Subfamily Odontophorninae)
    - Bobwhite quail (Northern) (*Colinus virginianus*)
    - California quail (*Callipepla californica*)
    - Coturnix quail (*Coturnix coturnix*)
    - Japanese quail (*Coturnix japonica*)
    - Scaled quail (*Callipepla squamata*)
  - Partridges and pheasants (Subfamily Phasianinae)
    - Chukar partridge (*Alectoris chukar*)
    - Gray partridge (Hungarian partridge) (*Perdix perdix*)
    - Common peafowl (*Pavo cristatus*)
    - Ring-necked pheasant (*Phasianus colchicus*)
  - Turkeys (Subfamily Meleagridinae)
    - Wild turkey (*Meleagris gallopavo*)
  - Guinea fowl (Subfamily Numidinae, *Numida* sp)
- Hawks, falcons, and vultures (Order Falconiformes)
  - Hawks, eagles, and kites (Family Accipitridae)
    - Eurasian sparrowhawk (*Accipiter nisus*)
    - Bald eagle (*Haliaeetus leucocephalus*)
    - Booted eagle (*Hieraaetus pennatus*)
    - Cooper's hawk (*Accipiter cooperii*)
    - Common buzzard (*Buteo buteo*)
    - Ferruginous hawk (*Buteo regalis*)
    - Golden eagle (*Aquila chrysaetos*)
    - Northern goshawk (*Accipiter gentilis*)
    - Imperial eagle (*Aquila heliaca*)
    - Northern harrier (marsh hawk) (*Circus cyaneus*)
    - Red-shouldered hawk (*Buteo lineatus*)
    - Red-tailed hawk (*Buteo jamaicensis*)
    - Rough-legged hawk (*Buteo lagopus*)
    - Sharp-shinned hawk (*Accipiter striatus*)
    - Steppe eagle (*Aquila nipalensis*)
    - White-tailed eagle (*Haliaeetus albicilla*)
    - Osprey (*Pandion haliaetus*)
  - Falcons and caracaras (Family Falconidae)
    - American kestrel (sparrowhawk) (*Falco sparverius*)
    - Gyrfalcon (*Falco rusticolus*)
    - Peregrine falcon (*Falco peregrinus*)
    - Prairie falcon (*Falco mexicanus*)
    - Red-headed falcon (*Falco chicquera*)
    - Saker falcon (*Falco cherrug*)
  - Vultures (Family Cathartidae)
    - California condor (*Gymnogyps californianus*)
    - King vulture (*Sarcoramphus papa*)
    - Turkey vulture (*Cathartes aura*)
- Herons, ibises, and storks (Order Ciconiiformes)
  - Flamingos (Family Phoenicopteridae)

Greater flamingo (*Phoenicopterus ruber*)
Herons, egrets, and bitterns (Family Ardeidae)
Bitterns (*Botaurus* sp*, Ixobrychus* sp)
Black-crowned night heron (*Nycticorax nycticorax*)
Great blue heron (*Ardea herodias*)
Great egret (common or american egret) (*Casmerodius albus*)
Snowy egret (*Egretta thula*)
Ibises and spoonbills (Family Threskiornithidae)
Glossy ibis (*Plegadis falcinellus*)
White ibis (*Eudocimus albus*)
White-faced ibis (*Plegadis chihi*)
Storks (Family Ciconiidae)
Wood stork (*Mycteria americana*)
Loons (Order Gaviiformes, Family Gaviidae)
Common loon (*Gavia immer*)
Pacific loon (*Gavia pacifica*)
Red-throated loon (*Gavia stellata*)
Owls (Order Strigiformes)
Typical owls (Family Strigidae)
Barred owl (*Strix varia*)
Eagle owl (*Bubo bubo*)
Eastern screech owl (*Otus asio*)
Great-horned owl (*Bubo virginianus*)
Long-eared owl (*Asio otus*)
Short-eared owl (*Asio flammeus*)
Snowy owl (*Nyctea scandiaca*)
Spotted owl (*Strix occidentalis*)
Barn-Owls (Family Tytonidae)
Barn owl (*Tyto alba*)
Parrots, parakeets, and macaws (Order Psittaciformes)
Parrots (Family Psittacidae)
Budgerigar (*Melopsittacus undulatus*)
Cockatiel (*Nymphicus hollandicus*)
Hawk-headed parrot *(Deroptyus accipitrinus*)
Lories (*Lorius* sp)
Lorikeets (*Trichoglossus* sp)
Lovebirds (*Agapornis* sp)
Macaws (*Ara* sp)
Puerto Rican parrot (*Amazona vittata*)
Rosellas (*Platycercus* sp)
Yellow-naped parrot (*Amazona auropalliata*)
Perching birds (Order Passeriformes)
Finches (Family Fringillidae)
American goldfinch (*Carduelis tristis*)
Apapane (*Himatione sanguinea*)
Cassin's finch (*Carpodacus cassinii*)
Eurasian bullfinch (*Pyrrhula pyrrhula*)
Evening grosbeak (*Coccothraustes vespertinus*)
Goldfinches (*Carduelis* sp)
House finch (*Carpodacus mexicanus*)
Pine siskin (*Carduelis pinus*)
Purple finch (*Carpodacus purpureus*)
Wood-warblers, tanagers, grosbeaks, sparrows, and blackbirds (Family Emberizidae)
Brown-headed cowbird (*Molothrus ater*)

Chipping sparrow (*Spizella passerina*)
Common grackle (*Quiscalus quiscula*)
Dusky seaside sparrow (*Ammospiza nigrescens*)
Northern cardinal (*Cardinalis cardinalis*)
Orioles (*Icterus* sp)
Red-winged blackbird (*Agelaius phoeniceus*)
Rufous-sided towhee (*Pipilo erythrophthalmus*)
Chickadees (Family Paridae)
Chestnut-backed chickadee (*Parus rufescens*)
Crows, jays, and magpies (Family Corvidae)
American Crow (*Corvus brachyrhychos*)
Blue jay (*Cyanocitta cristata*)
Eurasian jay (*Garrulus glandarius*)
Jackdaw (*Corvus monedula)*
Magpie (*Pica* sp)
Raven (*Corvus corax)*
Rook (*Corvus frugilegus*)
Steller's jay (*Cyanocitta stelleri*)
Waxwings (Family Bombycillidae)
Cedar waxwing (*Bombycilla cedrorum*)
Weavers (Family Ploceidae, *Ploceus* sp)
Old world sparrows (Passeridae)
House sparrow (English sparrow) (*Passer domesticus*)
Larks (Family Alaudidae)
Horned lark (*Eremophila alpestris*)
Mockingbirds and thrashers (Family Mimidae)
Northern mockingbird (*Mimus polyglottos*)
Thrashers (*Toxostoma* sp)
Nuthatches (Family Sittidae, *Sitta* sp)
Shrikes (Family Laniidae, *Lanius* sp)
Starlings (Family Sturnidae)
European starling (*Sturnus vulgaris*)
Mynas (*Acridotheres* sp*, Gracula* sp)
Swallows (Family Hirundinidae, *Hirundo* sp*, Tachycineta* sp*, Riparia* sp*, Stelgidopteryx* sp)
Martins (*Progne* sp)
Thrushes, solitaires, and bluebirds (Family Muscicapidae)
American robin *(Turdus migratorius*)
Bluebirds (*Sialia* sp)
Eurasian blackbird (*Turdus merula*)
Thrushes (*Turdus* sp, *Ixoreus* sp, *Hylocichla* sp, *Catharus* sp)
Estrildid finches (Family Estrildidae)
Java finch (*Padda oryzivora*)
Penguins (Order Sphenisciformes, Family Spheniscidae)
Blackfooted penguin (*Spheniscus demersus*)
Pigeons and doves (Order Columbiformes, Family Columbidae)
Band-tailed pigeon (*Columba fasciata*)
Mourning dove (*Zenaida macroura*)
Ringed turtle dove (*Streptopelia risoria*)
Rock dove (common pigeon) (*Columba livia*)
White-winged dove (*Zenaida asiatica*)
Wood pigeon (*Columba palumbus*)
Shorebirds (Order Charadriiformes)
Gulls, terns, skuas, and skimmers (Family Laridae)
California gull (*Larus californicus*)

Common tern (*Sterna hirundo*)
Franklin's gull (*Larus pipixcan*)
Glaucous-winged gull (*Larus glaucescens*)
Herring gull (*Larus argentatus*)
Kittiwakes (*Rissa* sp)
Laughing gull (*Larus atricilla*)
Least California tern (*Sterna antillarum*)
Ring-billed gull (*Larus delawarensis*)
Royal tern (*Sterna maxima*)
Skua (*Catharacta skua*)

Auks, murres, and puffins (Family Alcidae)
Common murre (*Uria aalge*)
Guillemots (*Cepphus* sp)
Murres (*Uria* sp)
Puffins (*Fratercula* sp)
Razorbill (*Alca torda*)

Plovers (Family Charadriidae, *Charadrius* sp*, Pluvialis* sp)

Sandpipers, turnstones, surfbirds, and phalaropes (Family Scolopacidae)
American woodcock (*Scolopax minor*)
Curlews (*Numenius* sp)
Long-billed dowitcher (*Limnodromus scolopaceus*)
Marbled godwit (*Limosa fedoa*)
Pectoral sandpiper (*Calidris melanotos*)
Ruddy turnstone (*Arenaria interpres*)
Semipalmated sandpiper (*Calidris pusilla*)
Spotted sandpiper (*Actitis macularia*)
Western sandpiper (*Calidris mauri*)

Stilts and avocets (Family Recurvirostridae)
American avocet (*Recurvirostra americana*)
Black stilt (*Himantopus novaezelandiae*)
Black-necked stilt (*Himantopus mexicanus*)

Waterfowl (Order Anseriformes, Family Anatidae)

Dabbling ducks
American wigeon (*Anas americana*)
American black duck (*Anas rubripes*)
Blue-winged teal (*Anas discors*)
Gadwall (*Anas strepera*)
Green-winged teal (*Anas crecca*)
Koloa duck (*Anas wyvilliana*)
Laysan duck (*Anas laysanensis*)
Mallard (*Anas platyrhynchos*)
Mottled duck (*Anas fulvigula*)
Muscovy duck (*Cairina moschata*)
Northern pintail (*Anas acuta*)
Northern shoveler (*Anas clypeata*)
White Pekin duck (*Anas platyrhynchos*)
Wood duck (*Aix sponsa*)

Diving ducks
Bufflehead (*Bucephala albeola*)
Canvasback (*Aythya valisineria*)
Common goldeneye (American goldeneye) (*Bucephala clangula*)
Greater scaup (*Aythya marila*)
Harlequin duck *(Histrionicus histrionicus*)
Lesser scaup (*Aythya affinis*)

Oldsquaw (*Clangula hyemalis*)
Redhead (*Aythya americana*)
Ring-necked duck (*Aythya collaris*)
Ruddy duck (*Oxyura jamaicensis*)

Sea ducks
Black scoter (common scoter) (*Melanitta nigra*)
Common eider (*Somateria mollissima*)
Common merganser (*Mergus merganser*)
Mergansers (*Mergus* sp, *Lophodytes* sp)
Red-breasted merganser *(Mergus serrator*)
Spectacled eider (*Somateria fischeri*)
Surf scoter (*Melanitta perspicillata*)
White-winged scoter (*Melanitta fusca*)

Geese (Tribe Anserini)
Aleutian Canada goose (*Branta canadensis leucopareia*)
Bean goose (*Anser fabalis*)
Black brant (*Branta bernicla nigricans*)
Brant (*Branta bernicla*)
Canada goose (*Branta canadensis*)
Hawiian goose (nene goose) (*Nesochen sandvicensis*)
Ross' goose (*Chen rossii*)
Snow goose (*Chen caerulescens*)
White-fronted goose (*Anser albifrons*)

Swans (Tribe Cygnini)
Bewick's swan (*Cygnus columbianus bewickii*)
Black swan (*Cygnus atratus*)
Mute swan (*Cygnus olor*)
Trumpeter swan (*Cygnus buccinator*)
Tundra swan (whistling swan) (*Cygnus columbianus*)
Whooper swan (*Cygnus cygnus*)

Whistling ducks (Tribe Dendrocygnini)
Fulvous whistling duck (*Dendrocygna bicolor*)

Woodpeckers (Order Piciformes, Family Picidae)
Red-cockaded woodpecker (*Picoides borealis*)

Sources

American Ornithologists' Union. 1983. Check-list of North American birds, (6th ed.): Lawrence, Kansas, Allen Press, 877 p.

Howard, R. and Moore, A. 1991. A complete checklist of the birds of the world, (2nd ed.): San Diego, California, Academic Press, 622 p.

Monroe, B. L. Jr., and Sibley, C. G. 1993. A world checklist of birds: New Haven, Connecticutt, Yale University Press, 393 p.

Appendix F

Common and scientific names other than birds

Mammals

- African lion (*Panthera leo*)
- Bears (*Ursus americanus*; *U. arctos*; *U. maritimus*)
- Beaver (*Castor canadensis*)
- Bighorn sheep (*Ovis canadensis*)
- Bison (*Bison bison*)
- Bobcat (*Felis rufus*)
- Caribou (New World and Siberia) (*Rangifer tarandus*)
- Chipmunks (*Tamias striatus* and *Eutamias* sp.)
- Cottontail rabbit (*Sylvilagus floridanus*)
- Coyote (*Canis latrans*)
- Deer (*Odocoileus* sp.)
- Elk (*Cervus elaphus*)
- Foxes (*Vulpes* sp., *Urocyon* sp., and *Alopex lagopus*)
- Fur seal (*Callorhinus ursinus*)
- Jackrabbits (*Lepus* sp.)
- Lynx (*Felis lynx*)
- Mink (*Mustela vison*)
- Muskrat (*Ondatra zibethicus*)
- Nutria (*Myocaster coypus*)
- Pronghorn antelope (*Antilocapra americana*)
- Puma (Mountain lion) (*Felis concolor*)
- Raccoon (*Procyon lotor*)
- Rats (*Rattus* sp.)
- Reindeer (Old World and Greenland) (*Rangifer tarandus*)
- Sea lions (*Zalophus californianus* and *Eumetopias jubata*)
- Voles - small, mouse-like mammals primarily of the genera *Clethrionomys* and *Microtus*.
- Weasels (*Mustela* sp.)

Invertebrates

- Asian tiger mosquito (*Aedes albopictus*)
- Black widow spider (*Latrodectus mactans*)
- Caecal worm (*Heterakis gallinarum*)

Fish

- Rainbow trout (*Salmo gairdneri*)

Plants

- Choke cherry (*Prunus virginiana*)

Appendix G

Chemical names

Common Names	Chemical Names
1080	Sodium monofluoracetate
2-PAM	Pralidoxime chloride
Alachlor (Lasso®)	2-Chloro-N-(2,6-diethylphenyl)-N-(methoxymethyl)acetamide
Aldicarb (Temik®)	2-Methyl-2-(methylthio)propanal O-[(methylamino)carbonyl]oxime
Aldrin	1,2,3,4,10,10-Hexachloro-1,4,4a,5,8,8a-hexahydro-1,4:5,8-dimethanonaphthalene
Antimycin	3-Methylbutanoic acid 3-[3-(formylamino)-2-hydroxybenzoyl]amino-8-hexyl-2,6-dimethyl-4,9-dioxo-1,5-dioxonan-7-yl ester
Aroclor®	Group of polychlorinated biphenyls
Atrazine	6-Chloro-N-ethyl-N'-(1-methylethyl)-1,3,5-triazine-2,4-diamine
Avitrol®	4-Aminopyridine
Bayluscide®	5-Chloro-N-(2-chloro-4-nitrophenyl)-2-hydroxybenzamide compound respectively with 2-aminoethanol(1:1)
Beuthanasia-D-Special®	Sodium pentobarbital
Bomyl®	3-[(Dimethoxyphosphinyl)oxy]-2-pentenedioic acid dimethyl ester
Brodifacoum (Talon®)	3-[3-(4'-Bromo[1-1'-biphenyl]-4-yl)-1,2,3,4-tetrahydro-1-napthalenyl]-4-hydroxy-2H-1-benzopyran-2-one
Captan	3a,4,7,7a-Tetrahydro-2- [(trichloromethyl)thio]-1H-isoindole-1,3(2H)-dione
Carbofuran	2,3-Dihydro-2,2-dimethyl-7-benzofuranol methylcarbamate
Chlorophacinone	2-[(4-Chlorophenyl)phenylacetyl]-1H-indene-1,3(2H)-dione
Chlorpyrifos	Phosphorothioic acid O,O-diethyl O-(3,5,6-trichloro-2-pyridinyl) ester
Chlordane	1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene
Clophens®	Group of polychlorinated biphenyls
Coumaphos	Phosphorothioic acid O-(3-chloro-4-methyl-2-oxo-2H-1-benzopyran-7-yl) O,O-diethyl ester
DDD	Dichlorodiphenyl dichloroethane
DDE	Dichlorodiphenyldichloroethylene
DDT	Dichloro diphenyl trichloroethane
Demeton (Systox®)	Phosphorothioic acid O,O-diethyl O-[2-(ethylthio)ethyl] ester mixture with O,O- diethyl S-[2-(ethylthio)ethyl]phosphorothioate
Diazinon	Phosphorothioic acid O,O-diethyl O-[6-methyl-2-(1-methylethyl)-4-pyrimidinyl] ester
Dicrotophos	Phosphoric acid 3-(dimethylamino)-1-methyl-3-oxo-1-propenyl dimethyl ester
Dieldrin	(1aα,2β,2aα,3β,6β,6aα,7β,7aα)-3,4,5,6,9,9-Hexachloro-1a,2,2a,3,6,6a,7,7a-octahydro-2,7:3,6-dimethanonaphth[2,3-b]oxirene

Common Names	Chemical Names
Dimethoate	Phosphorodithioic acid O,O-dimethyl S-[2-(methylamino)-2-oxoethyl] ester
Diphacinone	1,3-Inandione, 2-diphenylacetyl
Diquat®	Dipyrido(1,2-a:2',1'-c)pyrazinediium, 6,7-dihydro
Disulfoton	Phosphorodithioic acid O,O-diethyl S-[2-(ethylthio)ethyl] ester
EDTA	Ethylenediaminetetraacetic acid
Endosulfan	6,7,8,9,10,10-Hexachloro-1,5,5a,6,9,9a-hexahydro-6,9-methano-2,4,3-benzodioxathiepin 3-oxide
Endrin	(1aα,2β,2aβ,3α,6α,6aβ,7β,7aα)-3,4,5,6,9,9-Hexachloro-1a,2,2a,3,6,6a,7,7a-octahydro-2,7:3,6-dimethanonaphth[2,3-b]oxirene
Enflurane	2-Chloro-1-(difluoromethoxy)-1,1,2- trifluoroethane
Famphur	Phosphorothioic acid O-[4-[(dimethylamino)sulfonyl]phenyl] O,O-dimethyl ester
Fenamiphos	(1-Methylethyl)phosphoramidic acid ethyl 3-methyl-4-(methylthio)phenyl ester
Fenbendazole	[5-(Phenylthio)-1H-benzimidazol-2-yl]carbamic acid methyl ester
Fenclors®	Group of polychlorinated biphenyls
Fensulfothion	Phosphorothioic acid O,O-diethyl O-[4-methylsulfinyl)phenyl] ester
Fenthion	Phosphorothioic acid O,O-dimethyl O-[3-methyl-4-(methylthio)phenyl ester
Fonofos	Ethylphosphonodithioic acid O-ethyl S-phenyl ester
Formalin	Formaldehyde solution
Halothane	2-bromo-2-chloro-1,1,1-trifluoroethane
HCN	hydrogen cyanide gas
Heptachlor	1H-1,4,5,6,7,8,8-Heptachloro-3a,4,7,7a-tetrahydro-4,7-methanoindene
Hexaconazole	(RS)-2-(2,4-dichlorophenyl)-1-(IH-1,2,4,-triazol-1-yl)-hexan-2-ol
Hexane	C_6H_{14}
Isazophos (Triumph®)	Phosphorothioic acid O-[5-chloro-1-(1-methylethyl)-1H-1,2,4-triazol-3-yl] O,O-diethyl ester
Isoflurane	2-Chloro-2-(difluoromethoxy)-1,1,1-trifluoroethane
Ivermectin	22,23-Dihydroabamectin
Kanechlors®	Group of polychlorinated biphenyls
Lindane	(1α,2α,3β,4α,5α,5β)-1,2,3,4,5,6-Hexachlorocyclohexane
Methamidophos	Phosphoramidothioic acid O,S-dimethyl ester
Methiocarb	3,5-Dimethyl-4-(methylthio)phenyl methylcarbamate
Methoxyflurane	2,2-Dichloro-1,1-difluoro-1-methoxyethane
Mirex	1,1a,2,2,3,3a,4,5,5,5a,5b,6-Dodecachlorooctahydro-1,3,4-metheno-1H-cyclobuta[cd]pentalene
Monocrotophos	(E)-Phosphoric acid dimethyl [1-methyl-3-(methylamino)-3-oxo-1-propenyl] ester
Nitrapyrin	2-Chloro-6-(trichloromethyl)pyridine
OC	Organochlorine
OP	Organophosphate

Common Names	Chemical Names
Oxamyl	2-(Dimethylamino)-N-[[(methylamino)-carbonyl]oxy]-2-oxoethanimidothioic acid methyl ester
PAH	Polycyclic aromatic hydrocarbon
Parathion	Phosphorothioic acid O,O-diethyl O-(4-nitrophenyl) ester
PCB	Polychlorinated biphenyl
Permethrin	3-(2,2-Dichloroethenyl)-2,2-dimethylcyclopropanecarboxylic acid (3-phenoxyphenyl)methyl ester
Phenoclors®	Group of polychlorinated biphenyls
Phenol	C_6H_6O
Phorate	Phosphorodithioic acid O,O-diethyl S- [(ethylthio)methyl] ester
Phosmet	Phosphorodithioic acid S-[(1,3-dihydro-1,3- dioxo-2H-isoindol-2-yl)methyl] O,O-dimethyl ester
Phosphamidon	Phosphoric acid 2-chloro-3-(diethylamino)-1- methyl-3-oxo-1-propenyl dimethyl ester
Pyralenes®	Group of polychlorinated biphenyls
Rotenone	[2R-(2α,6aα,12aα)]-1,2,12,12a-Tetrahydro-8,9-dimethoxy-2-(1-methylethenyl)[1]benzopyrano[3,4-b]furo[2,3-h]benzopyran-6(6aH)-one
Sleepaway®	Sodium pentobarbital
Starlicide®	3-Chloro-p-toluidine hydrochloride
Strychnine	$C_{21}H_{22}N_2O_2$
Terbufos (Counter®)	Phosphorodithioic acid S-[[(1,1-dimethylethyl)thio]methyl] O,O-diethyl ester
Thiabendazole	2-(4-Thiazoyl)-1H-benzimidazole
Thiram	Tetramethylthioperoxydicarbonic diamide
Toxaphene	Chlorinated camphene
Warfarin	4-Hydroxy-3-(3-oxo-1-phenylbutyl)-2H-1-benzopyran-2-one
Zectran®	4-(Dimethylamino)-3,5-dimethylphenol methylcarbamate (ester)
Ziram	(T-4)-Bis(dimethylcarbamodithioato-S,-S^1)zinc

Sources

Howard, P.H., and Neal, M., 1992, Distionary of chemical names and synonyms: Boca Raton, Florida, Lewis Publishers, 1,394 p.

Budavari, S., O'neil, M.J., Smith, A., and others, (eds.),1996, The Merck index, 12th ed.): Whitehouse Station, New Jersey, Merck and Co., 1,741 p.

Meister, R.T. (ed.), 1996, Farm chemicals handbook '96: Willoughby, Ohio, Meister Publishing Co., 446 p.

Appendix H

Conversion table

The units of measurement that are used by laboratories for recording the results of scientific or diagnostic tests are reported in this Manual in the metric or SI units (from the French “Le System International d’Unites”) that are customary for those results. Other units of measurement, such as those that are used in the field for reporting area or length, are reported in the inch-pound units that are common in the United States. The lists of conversion factors and abbreviations below are for those who are interested in converting the basic units of measurement that are used in this Manual to the system of choice. For temperature, use the equations provided.

To convert SI to inch-pound

	Multiply	*By*	*To obtain*
Length			
	millimeters (mm)	0.039	inch (in.)
	centimeters (cm)	0.39	inch (in.)
	meter (m)	3.28	foot (ft)
	meter (m)	1.09	yard (yd)
	kilometer (km)	0.62	mile (mi)
Weight			
	kilogram (kg)	2.21	pound (lb)
	metric ton	1.10	short ton
Volume or capacity			
	milliliters (mL)	0.03	fluid ounce (fl. oz)
	microliters (µL)	0.003	fluid ounce (fl. oz)
Temperature			
	°C, degrees Celsius, to °F, degrees Fahrenheit		9/5 x °C + 32 = °F

To convert inch-pound to SI

	Multiply	*By*	*To obtain*
Length			
	inch (in.)	25.4	millimeters (mm)
	foot (ft)	2.54	centimeters (cm)
	mile (mi)	0.3048	kilometer (km)
Area			
	acre	4,047	square meters (m^2)
Weight			
	pound (lb)	0.4356	kilogram (kg)
	short ton	0.907	metric ton
Temperature			
	°F, degrees Fahrenheit, to °C, degrees Celsius		
	(°F - 32) X 5/9 = °C		

Other abbreviated units of measurement used in this Manual:

cc	cubic centimeter, a unit of measurement that indicates the dosage of a drug or substance that is administered intravenously or by injection.
µg/g	micrograms per gram
mg/kg	milligrams per kilogram

Conversion table for units of measurement that are frequently used with the toxicology of pesticides:

Concentration of compound in tissue, food, or water, in SI units	Concentration of compound in tissue, food, or water, in parts per million (ppm)
1 nanogram per gram (1 ng/g)	0.001
1 microgram per 100 grams (1 μg/100 g)	0.01
1 milligram per kilogram (1 mg/kg)	1
1 microgram per gram (1 μg/g)	1
1 microgram per 100 milligrams (1 μg/100 mg)	10
1 milligram per 100 grams (1 mg/100 g)	10
1 milligram per gram (1 mg/g)	1,000
Concentration of compound in air, in SI units	**Concentration of compound in air, in parts per million (ppm)**
1 microgram per liter (1 μg/L)	1

Glossary

Abdomen — the portion of the body that lies between the thorax and the pelvis.

Abdominal cavity — the space that contains the abdominal viscera (the liver, spleen, intestines, etc.).

Abdominal wall — the layers of muscles lying between the skin and the abdominal cavity.

Absorption — to take in a substance through the pores or cells of a tissue. The substance must pass through the tissue to be absorbed.

Acanthocephalans — cylindrical, unsegmented worms that attach to the host by a retractable proboscis with sharp hooks.

Acaracides – substances, such as pesticides, that kill mites.

Acariasis — infestation of the body by mites.

Accipiters — short winged, long-tailed hawks; North American species are goshawk, Cooper's hawk, and sharp-shinned hawk.

Acute — sharp or severe, such as an illness with a sudden onset and a relatively short course.

Air sacs — thin-walled sacs that communicate with the lungs and are part of the avian respiratory system.

Airsacculitis — inflammation of the air sacs in birds.

Alcids — typically, pelagic colonial nesting seabirds, including species such as auklets, guillemots, murres, murrelets, and puffins.

Algae — a special form of plant life that lacks true roots, stems, or leaves, and that ranges in size from microscopic single cells to multicellular structures, such as seaweeds.

Alimentary canal — the digestive tract.

Allergic disease — development of a hypersensitivity of the host to substances foreign to the body, primarily antigens and other proteins.

Altricial — refers to newly hatched birds that require care in the nest for some period of time.

Ambient temperature — room or environmental temperature.

Amino acids — organic compounds of specific composition from which proteins are synthesized.

Amphibians — coldblooded animals characterized by moist, smooth skin that live both on land and in water at various life stages and that have gills at some stage of development, that is, frogs, toads, salamanders.

Amplification host — a host in which disease agents, such as viruses, increase in number.

Amyloid deposit — a complex protein material that grossly resembles starch and that in certain abnormal conditions accumulates in various body tissues causing cellular damage and injury to the affected organ.

Anaerobic — absence of oxygen; often refers to an organism that grows, lives, or is found in an environment devoid of oxygen, such as the cellular form of `Clostridium botulinum`, which causes avian botulism.

Analgesia — the absence of normal sensitivity to pain, typically, being in a semiconscious state induced through an anesthetic.

Anemia — a reduction in the normal number of red blood cells, or erythrocytes, in the body.

Anesthetic — a drug used to temporarily deaden pain.

Anesthetic induction time — the time between administering an anesthetic chemical and the actual time when target nerves are deadened.

Animal pathogens — organisms such as viruses, bacteria, and parasites, that are capable of invading and infecting animal hosts and causing disease.

Annelids — a group of invertebrates characterized by the segmented worms, including those in marine and freshwater and earthworms in addition to leeches.

Anorexia — lack of appetite.

Anoxia — a total lack of oxygen caused by several mechanisms that prevent oxygen from reaching the mitochondria of cells. Anoxia indicates a level of oxygen in animal tissues that is below normal in the presence of an adequate blood supply.

Antibody — a specialized serum protein produced by the immune system in response to an antigen in an attempt to counteract the effects of the antigen; antibodies in the blood indicate exposure to specific antigens or disease agents.

Antidote — substances that counteract or prevent the action of a poison.

Antigen — any foreign substance (generally proteins) to which the body reacts by producing antibodies. Antigens may be soluble substances such as toxins, particulate matter such as pollen, or microorganisms such as bacteria and viruses.

Antiserum — a serum containing antibodies to specific antigens; can be used to test biological samples for the presence of specific antigens.

Antitoxin — any substance that counteracts the action of a toxin or poison; generally, a specific type of antibody produced in experimental animals as a result of exposure to a specific toxin. Botulism antitoxin, for example, can be produced by exposing an animal to low levels of botulism toxin over a long period of time and then harvesting serum from that animal to treat other animals.

Arbovirus — a virus that is transmitted by invertebrates of the phylum Arthropoda [insects, arachnids (spiders, mites, ticks, etc.) and crustaceans].

Arthropod — members of the phylum Arthropoda (insects, arachnids, and crustaceans).

Ascites — accumulation of fluid in the abdominal cavity.

Aseptic — free from infection; sterile.

Asexual reproduction — the formation of new individuals without the union with cells of the opposite sex and usually by an individual.

Asymptomatic — without visible signs of illness; an asymptomatic carrier is an organism that harbors a disease agent, but that shows no outward signs.

Ataxia — incoordination.

Avicides — chemical substances used to kill or repel birds.

Avirulent — not virulent, does not cause disease.

Bacterin — a vaccine consisting of killed bacteria that is used for protection against infection by a specific bacterial disease.

Bacteriophage — a virus that infects a bacterium.

Bacterium — singular for bacteria. Any of a group of microscopic, unicellular organisms that have distinct cell membranes and that lack a distinct nucleus surrounded by a nuclear membrane.

Barbiturate — a type of sedative or anesthetic that is chemically derived from barbituric acid.

Bay diving ducks — typically, ducks that feed in deep bodies of water, usually in coastal bays and deep lakes. Species include canvasback, goldeneyes, redhead, and scaup.

Benign — noninvasive, that is, tumors that do not spread to other parts of the body; not malignant.

Big game — hunted species of large mammals (from deer to elephants).

Bile — yellow-brown to greenish liquid secreted by the liver and stored in the gallbladder before excretion by way of the intestine. Bile is composed of metabolic breakdown products derived from hemoglobin and other metabolic waste products.

Bioaccumulation — the accumulation of long-lived toxins, such as chlorinated hydrocarbons, as a result of repeated exposure or of exposure from a variety of sources.

Biomagnification — an increase in concentrations of long-lived contaminants in animals at higher positions in the food chain.

Biota — the plant and animal life of an area.

Biotoxins — poisons produced by and derived from the cells or secretions of a living organism, either plant or animal.

Birds of prey — synonymous with raptors; includes eagles, hawks, falcons, kites, and owls.

Biting louse — see Hippobascid flies.

Black flies — small, bloodsucking, biting flies of the genus *Simulium*; vectors for *Leucocytozoon* infections.

Blood flukes — trematode parasites that are found in the blood cells of the host.

Brine flies — species of flies whose larvae live in brine.

Brooding — care of young birds by the adult.

Buffered formalin — a 3.7 percent solution of formaldehyde (equal to 10 percent formalin) to which sodium phosphate buffers have been added. Buffered formalin is the best overall fixative for tissue for later microscopic study.

Bumblefoot — an inflammation and, often, swelling of the foot of birds as the result of a bacterial infection.

Bursa of Fabricious — a saclike outgrowth of the cloaca of birds that is part of the avian immune system.

Buteos — a subfamily of the hawks characterized by soaring behavior, broad, rounded wings, and a broad, fanned tail, such as the red-tailed hawk.

Caecum (British; plural caeca) or cecum (American; plural ceca) — a large, blind pouch or sac (often a pair) at the junction of the small intestine and the large intestine.

Calcification — the process by which tissues become hardened by the deposition of calcium salts.

Canidia — fungal spores.

Canker — synonymous with trichomoniasis in doves and pigeons.

Capture myopathy — a state of immobility resulting from damage to skeletal and cardiac muscles caused by extreme physical exertion, struggle, or stress; may occur in wildlife as they are chased in capture attempts; may appear later when captured wildlife are under physical restraint; or may appear after they have been released.

Cardiac muscle — heart muscle.

Cardiovascular system — the heart and blood vessels by

which blood is pumped and circulated through the body.

Carnivores — refers to flesheating mammals in the Order Carnivora and includes dogs, skunks, weasels, cats, raccoons, etc.

Carrion — dead and decaying flesh.

Caseous — resembling cheese or curd.

Central nervous system — the brain and spinal cord.

Ceratopogonid flies — very small, bloodsucking gnats commonly known as punkies, no-see-ums, or sand flies.

Cercaria — the final free-swimming larval stage of a trematode parasite.

Cestodes — flattened, usually segmented, parasitic worms; tapeworms.

Chelating chemical — a chemical that combines with a metal ion in a firm, ringlike band and that prevents the metallic ion from having any further biochemical effect.

Chlorinated hydrocarbons — organic compounds characterized by the presence of chlorine; commonly refers to persistent chemicals with insecticidal properties; DDT and dieldrin are common examples.

Choana — one of the paired openings on the inner side of the maxilla (upper beak), near the back of the oral cavity, that opens into the nasal cavity.

Cholinesterase enzymes — enzymes that are particularly important in the transmission of nerve impulses; the activity of these enzymes is inhibited by exposure to organophosphorus and carbamate compounds, and death results when activity is greatly reduced.

Chronic — persisting for a relatively long time.

Chronic losses — mortality of attrition; small numbers of continual losses over extended periods of time.

Clinical sign — an abnormal physiological change or behavior pattern that is indicative of illness. Signs are externally observable, as contrasted with symptoms, which are subjective.

Cloaca — a common passage for the fecal, urinary, and reproductive discharges of most lower vertebrates (birds, reptiles, and amphibians).

Coalescence — the fusion or growing together of tissue damage from a disease agent.

Coldblooded vertebrates — species such as fishes and reptiles, which have blood that varies in temperature to approximately that of the surrounding environment.

Colibacillosis — infection with the bacterium *Escherichia coli*.

Colon — the large intestine.

Colonial nesters — birds that nest in large groups.

Comatose — in a coma or comalike state; an abnormal state of continuous deep unconsciousness.

Congener — a member of the same taxonomic grouping, such as polychlorinated biphenyls, that possess similar chemical structures.

Congenital abnormality — usually an anatomical malformation that results from incomplete growth during embryonic development. Also refers to an abnormal biochemical pathway caused by a genetic factor.

Congestion — the abnormal accumulation of blood in a tissue or organ; often causes a reddening of the affected area.

Contagious — capable of being transmitted from animal to animal, such as a contagious disease.

Coccidiasis — the presence of coccidia, protozoa of the subphylum Sporozoa.

Coccidiosis — a disease caused by coccidia, protozoa of the subphylum Sporozoa.

Cornea — the transparent tissue on the front of the eyeball that covers the iris and pupil, through which light passes to the interior.

Coronary band — a fatty band encircling the heart; in hooved animals, the germinal layer beneath skin at the junction of the skin and hoof.

Cracker shell — a shotgun shell that is loaded to produce a visible burst and loud sound in order to frighten animals.

Crop — a dilation of the esophagus at the base of the neck of some birds.

Crustacea — a specialized group of invertebrates that includes such diverse species as lobster, shrimp, barnacles, wood lice, and water fleas.

Cygnet — a young swan.

Cyanobacteria — a genus of bacteria composed of the blue-green algae; like the dinoflagellates, cyanobacteria are important sources of environmental toxins that can cause illness and death in humans and wildlife.

Cyanosis — a bluish discoloration of the skin and mucous membranes due to an excessive concentration of deoxygenated hemoglobin in the blood.

Cystocanth — an infective juvenile stage of thorny-headed worms (acanthocephalan parasites).

Cytoplasm — the aqueous part of the cell that is outside of the nucleus but that is contained within the cell wall. The cytoplasm is the site of most of the chemical activities of the cell.

Dabbling ducks — Ducks that feed on the surface or in shal-

low water, including mallard, American black duck, gadwall, American wigeon, northern pintail, northern shoveler, and teal. Also referred to as puddle ducks.

Definitive host — an organism in which sexually mature stages of a parasite occur.

Dehydration — a condition that results from excessive loss of body fluids.

Depopulation — the destruction of an exposed or infected group of animals.

Dermatophytosis — a fungal infection of the skin.

Dessication — the act or process of drying a substance.

Digestive tract (alimentary canal) — the organs associated with the ingestion, digestion, and absorption of food, such as the esophagus, stomach, and intestines.

Dinoflagellates — aquatic protozoa that are an important component of plankton. These single-celled organisms may be present in vast numbers, causing discoloration of the water referred to as "red tide." Some species secrete powerful neurotoxins.

Dioxins — a chemical component of defoliants, such as agent orange, that are considered to be carcinogenic (cause cancer), teratogenic (cause fetal abnormalities), and mutagenic (cause abnormal mutation rate).

Direct life cycle — a parasitic life cycle that requires only a single host for its completion.

Diurnal — active during the day.

Diving ducks — synonymous with bay diving ducks.

Domestic duck — ducks typically raised for market, such as the white Pekin.

Drive-trapping — capture of flightless birds during the molt and of other animals by herding them into a netted or fenced containment area.

Drop nets — suspended nets used to capture animals by remote release of the nets or triggering mechanisms at the net site.

Dyspnea — labored breathing.

Ecchymotic — a hemorrhagic, irregular-shaped area in tissues that is bruise-like in appearance and, often, in color.

Ecology — the study of the interrelationships between living organisms and their environment.

Ectoparasite — a parasite that lives on the external surface, or in the integument, of its host.

Ectotherms — species that rely on sources of heat outside themselves (i.e., coldblooded species).

Edematous — swelling of tissues due to abnormal accumulation of fluid in the intercellular tissue spaces; seepage of these fluids may result in accumulations within the body cavity.

EDTA — ethylenediamine tetra-acetic acid; a chelating agent that binds with lead and that is used in the treatment of lead poisoning.

EEE — eastern equine encephalomyelitis; a viral disease.

ELISA — a molecular-based enzyme-linked immonosorbent assay; a type of test used to detect either antigen or antibody.

Emaciation — a wasted condition of the body; excessive leanness.

Emasculatome — a veterinary instrument designed for bloodless castration of cattle or sheep; has been used for euthanasia of birds by cervical dislocation.

Encrustation — forming a crust or a covering; for example, salt encrustation.

Endemic — a disease that commonly is present within a population or a geographical area.

Endogenous phase — developmental phase of the life cycle of a parasite that occurs within the host.

Endoparasite — a parasite that lives within the body of its host.

Endotherms — warmblooded vertebrates; species able to internally regulate their body temperatures.

Enteritis — inflammation of the intestine.

Enzootic — an animal disease that commonly is present within a population or geographical area.

Epicardium — the outer covering of the heart.

Epidemic — the presence of a disease in a population or in an area in a higher than expected prevalence, or rate.

Epithelial cells — cells that cover the external and internal surfaces of the body.

Epizootic — a disease affecting a greater number of animals than normal; typically, occurrences involving many animals in the same region at the same time.

Epizootiology — the study of the natural history of disease in animal populations.

Erosion — wearing away; gradual disintegration.

Erythrocytes — red blood cells; serve to transport oxygen throughout the body.

Esophagus — the passage extending from the mouth to the stomach.

Estrogenic — possessing characteristics of the hormone estrogen; estrogenic compounds may elicit the development of feminine characteristics in male animals.

Etiologic agent — any living or nonliving thing, power, or

substance capable of causing a disease.

Eutrophication — the excessive growth, caused by an oversupply of nutrients, of plants and algae in bodies of water.

Exotic disease — a disease that normally does not occur within a particular area.

Exotoxin — a toxin formed and excreted by bacterial cells.

Exsanguination (bleeding out) — the draining of blood from an animal.

Fastidious — refers to the very specific requirements for the culture of some bacteria.

Fauna — the animals of an area.

"Feather edge" — a long, shallow edge of a body of water that gradually deepens offshore.

Femur — the thigh bone of humans; the upper legbone in hooved mammals and birds. The bone between the pelvis and the knee.

Feral pigeon — rock dove.

Fibrin — an insoluble protein that forms a network of fibers during clotting of the blood.

Fibrinoperitonitis — fibrin-coated inflammation of the surfaces of the peritoneal cavity.

Fibrinous — a pathologic term referring to a threadlike sheet of material that may occur on surfaces of organs in some disease conditions; clotting factors in blood contribute to the structure of this material.

Flatworms — the common name for parasites of the phylum Platyhelminthes, flukes or trematodes.

Flukes — parasitic flatworms; also referred to as trematodes.

Flylarvae — maggots.

Fomite — an object that is not in itself harmful, such as a wooden object or article of clothing, but that may harbor pathogenic microorganisms and serve to transmit an infection to a living organism.

Food chain — ascending trophic levels within an ecosystem in which species at the lower level are the primary food base for the species at the next highest level.

Formalin — a liquid solution of formaldehyde that is used as a tissue fixative, usually to prepare tissues for microscopic examination.

Fossorial — refers to digging animals that live in burrows.

Frounce — synonymous with trichomoniasis in raptors.

Fungicides — chemicals that kill fungi.

Gallinaceous birds — heavy-bodied, chickenlike land birds. Includes ring-necked pheasant, quails, grouse, and wild turkey.

Gamete — one of two cells produced by a gametocyte; the union of male and female gametes initiates the development of a new individual during sexual reproduction

Gametocyte — an undifferentiated cell that develops into a gamete.

Gangrene — tissue death due to a failure of the blood supply to that tissue area followed by bacterial invasion and putrefication.

Gapes — see gapeworm.

Gapeworm — parasites of the trachea of birds; synonym for tracheal worms.

Gastrointestinal tract — the tubular organs that form a digestive pathway from the mouth to the vent, including the stomach and intestines.

Geographic information system — a specialized computer system for storage, manipulation, and presentation of layers of geographical information.

Gizzard — the enlarged muscular ventriculus (stomach) of many birds.

Granuloma — refers to a tumorlike mass or nodule; often associated with a response to an infection.

Haemoproteus — blood parasites transmitted by louse flies of the family Hippoboscidae and midges of the family Ceratopogonidae.

Hatchet-breast — a common term to describe the prominent, protruding breast keel seen as the result of the atrophy of the breast muscles. "The keel appears as sharp and as prominent as the back of a hatchet."

Hawaiian forest birds — native and introduced avifauna of the forested areas of the Hawaiian Islands. Includes such species as sparrows, finches, cardinals, honeycreepers, and thrushes.

Helminths — parasitic worms.

Hemosporidia — protozoan blood parasites.

Hemoglobin — the oxygen-carrying pigment of red blood cells.

Hemozoin — a dark pigment produced from the hemoglobin in the host's red blood cells by malarial parasites that collect in tissues, such as the spleen and liver, causing those organs to appear grayish to dark brown or black.

Hepatitis — inflammation of the liver.

Hepatomegaly — enlargement of the liver.

Herbicides — chemicals used to kill unwanted vegetation.

Hermaphroditic — organisms that possess both male and female functional reproductive organs.

Herpesvirus — one of the major groups of related viruses that have DNA nucleic acids and that are further characterized by similar size, shape, and physiochemical reactions.

Herpetologists — those who study the natural history and biology of reptiles.

Heterogenous organism — one that is derived from a combination of different types of parent organisms.

Hippoboscid flies — a group of wingless and winged parasitic flies found on birds and mammals.

Histoplasmosis — a disease of humans caused by inhalation of the fungus *Histoplasma capsulatum*.

History — as it refers to wildlife disease investigations, a record of background information and chronological events associated with a die-off.

Homeostasis — the tendency toward equilibrium; refers to the capacity of living organisms to maintain internal body environmental conditions necessary for survival.

Husbandry practice — the care and maintenance of animals.

Hydropericardium — an excessive amount of fluid within the sac surrounding the heart.

Hypersensitivity — greater than normal sensitivity to stimuli or to biological agents.

Hypothermia — greatly reduced body temperature.

Hypovalemic shock — shock resulting from insufficient blood volume to maintain adequate cardiac output and blood pressure; caused by acute hemorrhage or excessive fluid loss.

Icthyologists — those who study the natural history and biology of fishes.

Immune — being resistant to a disease.

Immunosuppressive therapy — a medical treatment that suppresses the normal immune response.

Impaction — an abnormal accumulation of food or other ingested materials that become lodged in a section of the digestive tract.

Immune system — the combination of host body defenses that guard against infectious disease.

Inapparent — an infection in which the infectious agent exists within the host but that causes no recognizable signs of illness; the infectious agent may or may not be shed at irregular times.

Incidence — the number of new cases of a disease occurring in a population within a certain time period.

Inclusion body — a structure within the cytoplasm or nucleus of a cell; a characteristic of some viral diseases, inclussion bodies occur in only a few species.

Incubation period — the time interval required for the development of disease; the time between the invasion of the body by a disease agent and the appearance of the first clinical signs.

Indigenous — native to a particular area.

Indirect life cycle — a life cycle that requires more than one host for its completion.

Infection — the invasion and multiplication of an infectious agent in host body tissues.

Infectious agent — a living organism capable of invading another.

Infective — capable of producing infection.

Infestation — parasitic invasion of external surfaces of a host.

Insecticides — pesticides used to kill insects.

Intermediate host — an organism in which a parasite undergoes a stage of asexual development.

Intracellular parasite — a parasitic organism, usually microscopic, that lives within the cells of the host animal.

Involuntary muscle — muscle that is not under the control of the individual.

Isolate — refers to microorganisms; the separation of a population of organisms that occur in a particular sample (verb); for example, to isolate a bacterial or viral organism from a sample. As a noun, refers to the organism that was isolated; for example, a bacterial isolate was obtained from a sample.

Isopods — crustaceans with flattened bodies, such as sowbugs, pillbugs, and wood lice.

Joint capsule — the thick, fibrous capsule surrounding a joint, as around the knee.

Keel — the narrow middle portion of a bird's sternum.

Kites — hawk-like birds.

Lacrimal discharge — a discharge from the tear glands near the eye.

Laparotomy — a surgical procedure in which an incision is made into the abdominal cavity, often to determine the sex of birds for which plumage and other characteristics cannot be used for that purpose.

Larva — an immature parasitic life cycle stage; typically, the form of the parasite is unlike the mature stage.

Larynx — the musculocartilaginous structure at the upper part of the trachea; it guards the entrance to the trachea and secondarily serves as the organ of voice.

Latent — dormant or concealed; a latent infection refers to the situation in which a disease condition is not apparent.

Lentogenic — refers to a form of Newcastle disease virus

that is mildly virulent as measured in chickens.

Leucocytozoon — blood parasites transmitted by black flies of the family Simulidae.

Lesion — an abnormal change in tissue or an organ due to disease or injury.

Lethargy — abnormal drowsiness or stupor.

Louse fly — see Hippoboscid flies.

Lyme disease — an infectious disease that is caused by the spirochete *Borrelia burgdorferi* and transmitted by ticks.

Lipophilic — having an affinity for fat; such as chemicals that accumulate in fat and fatty tissues.

Livestock — domestic animals raised for food and fiber commonly refers to animals such as hogs, sheep, cattle, and horses.

M-44 — a predator-control device that uses cyanide as the toxic component.

Macrocyst — a large cyst; a large spore case (fungi); an encapsulated reproductive cell of some slime molds.

Macrogamete — the female sexual form of the malaria parasite that is found in the gut of the mosquito vector.

Maggot — a soft-bodied larva of an insect, especially a form that lives in decaying flesh.

Malarias — infectious diseases caused by protozoan parasites that attack the red blood cells.

Malignant — spread from the location of origin to other areas; that is, tumors that are invasive and that spread throughout the body.

Marek's disease — an important infectious disease of poultry, that is caused by infection with a herpesvirus.

Marine birds — birds of the open ocean, typically pelagic, and often colonial nesters, such as alcids, shearwaters, storm petrels, gannets, boobies, and frigatebirds.

Meningoencephalitis — inflammation of the transparent covering (meninges) of the brain.

Mergansers — a group of waterfowl that are commonly referred to as "fish ducks" due to their food habits.

Meront — an asexual stage in the development of some protozoan parasites that gives rise to merozoites.

Merozoite — a stage in the life cycle of some protozoan parasites.

Mesogenic — refers to a form of Newcastle disease virus that is moderately virulent as measured in chickens.

Metabolic rate — an expression of the rate at which oxygen is used by cells of the body.

Metacercaria — the encysted resting or maturing stage of a trematode (fluke) parasite in the tissues of an intermediate host.

Microgamete — the male sexual form of the malaria parasite found in the gut of the mosquito vector.

Migratory birds — all birds listed under the provisions of the Migratory Bird Treaty Act.

Minamata disease — mercury poisoning of humans; named after an incident resulting from contamination within Minamata Bay, Japan.

Miracidium — the first larval stage of a trematode parasite, which undergoes further development in the body of a snail.

Mobilization — refers to the tendency of lipophilic chemicals [environmental contaminants, such as chlorinated hydrocarbons, that have an affinity for storage in adipose (fat) tissue] to be released into the bloodstream as fat stores are depleted.

Mollusks — species of the phylum Mollusca; includes snails, slugs, mussels, oysters, clams, octopuses, nautiluses, squids, and similar species.

Molt — the normal shedding of hair, horns, feathers, and external skin before replacement by new growth.

Moribund — a visible, debilitated state resulting from disease; appearing to be suffering from disease and close to death.

Motility/motile/nonmotile — these terms refer to whether or not a bacterial organism moves on a particular culture medium; such movement reflects the presence of flagellae. Thus, the absence or presence of motility is a useful characteristic for identifying bacteria.

Motor paralysis — paralysis of the voluntary muscles.

Mucosa — a mucous membrane.

Mucous membrane — the layer of tissue that lines a cavity or the intestinal tract and that secretes a mixture of salts, sloughed cells, white blood cells, and proteins.

Mucosal surface — a layer of cells lining the inside of the intestinal tract or other body part that secretes mucus.

Myocarditis — inflammation of heart muscle.

Myocardium — the middle and thickest layer of the heart wall; composed of cardiac muscle.

Mycosis — fungal infection.

Mycotoxin — a poison produced by various species of molds (fungi).

Myiasis — infestation of the body by fly maggots.

Nares — the external openings on the top of the bill of birds; the external orifices of the nose; the nostrils.

Nasal gland — a specialized gland of birds and some other species that serves to concentrate salt and secrete it from the body.

Nasal cavity — the forward (proximal) portion of the passages of the respiratory system, extending from the nares to the pharynx and separated from the oral cavity by the roof of the mouth.

NDV — Newcastle disease virus.

Necropsy — the methodical examination of the internal organs and tissues of an animal after death to determine the cause of death or to observe and record pathological changes.

Necrosis — the death of cells in an organ or tissue.

Necrotic — dead; exhibiting morphological changes indicative of cell death; in this Manual, necrotic lesions refer to areas of dead tissue.

Nematocides — chemicals used to kill nematode worms.

Nematodes — unsegmented, cylindrical parasitic worms; roundworm.

Neoplasm — see tumor.

Nervous system — specialized components of vertebrates, and, to a lesser extent invertebrates, that control body actions and reactions to stimuli and the surrounding environment.

Neurotoxin — toxins that cause damage to or destroy nerve tissue.

Nictitating membrane — the so-called third eyelid, a fold of tissue connected to the medial (side closest to the midline) side of the eye, which moves across the eye to moisten and protect it.

Nocturnal — species that are active during evening (nondaylight) hours.

Nodule — a small mass of tissue that is firm, discrete, and detectable by touch.

Nontoxic shot — shotshells with shotpellets that are not made of lead or other toxic metals; typically, soft iron is used, and is referred to as steel shot.

No-see-ums — see Ceratopognid flies.

Occlusion — a blockage or obstruction; the closure of teeth.

Oligochaetes — the earthworms and aquatic forms of the class Oligochaeta.

Oocyst — the encysted or encapsulated zygote in the stage of some protozoan parasites; often highly resistant to environmental conditions.

Opisthotonos — abnormal spasm of the neck and back muscles resulting in a body position in which the head and heels are involuntarily thrown back and the body is arched forward.

Osmoregulation — adjustment of osmotic pressure in relation to the surrounding environment.

Osteoporosis — loss of bone structure.

PAH — an acronym for polycyclic aromatic hydrocarbons.

Panzootic — a disease involving animals within a wide geographic area such as a region, continent, or globally.

Parasitism — an association between two species in which one (the parasite) benefits from the other (the host), often by obtaining nutrients.

Paratenic host — a host that has been invaded by a parasite, but within which no morphological or reproductive development of the parasite takes place; a “transport” host.

Paresis — partial paralysis.

Passerines — small- to medium-sized perching birds.

Pathogenic — the ability to cause disease.

Pathological — an adjective used to describe structural or functional changes that have occurred as the result of a disease.

PCB — acronym for polychlorinated biphenyls, a group of chlorinated aromatic hydrocarbons used in a variety of commercial applications. These compounds have long environmental persistence and have been a source for various toxic effects in a wide variety of fauna.

Pelagic — refers to living in or near large bodies of water, such as oceans or seas; typically, this term refers to avian species that only come to land areas during the breeding season.

Pericardium — the fibrous sac surrounding the heart.

Pericarditis — inflammation and thickening of the sac surrounding the heart.

Peritoneal cavity — the abdominal cavity, which contains the visceral organs.

Phage — a virus that has been isolated from a prokaryote (an organism without a defined nucleus, having a single double-standard DNA molecule, a true cell wall, and other characteristics). Most phages are bacterial viruses.

Pharynx — the musculomembranous passage between the mouth and the larynx and esophagus.

Pigeon milk — the regurgitated liquid that an adult pigeon feeds its young.

Pinnipeds — aquatic mammals that include the sea lions, fur seals, walruses, and earless seals.

Plaque — a patch or a flat area, often on the surface of an organ.

Plasmodium — blood parasites transmitted by mosquitos of the family Culicidae.

Plumage — the feather covering of birds.

Postmortem — examination and dissection of animal carcasses performed after the death of the animal. Also, changes that occur in tissues after death.

Poultry — domestic avian species, such as chickens and domestic ducks, geese, and turkeys.

Prefledglings — birds of the current hatch year that have not become feathered enough to fly.

Prevalence — the number of cases of a disease occurring at a particular time in a designated or defined area; rate.

Proboscis — a tubular process or structure of the head or snout of an animal, usually used in feeding; in this Manual, the tubular process of Acanthocephalan parasites is used for attachment to the host and feeding from it.

Protoporphyrin — a component of hemoglobin; useful in the diagnosis of exposure to lead.

Protozoan — a one-celled animal with a recognizable nucleus, cytoplasm, and cytoplasmic structures.

Psittacines — parrots, parakeets, and other species within the family Psittacidae.

Puddle ducks — see dabbling ducks.

Proventriculus — the first, or "glandular," stomach of a bird.

Puddle ducks — synonymous with dabbling or surface-feeding ducks.

Punkies — small, biting midges of the genus `Culicoides`; vectors for `Haemoproteus` infections. See ceratopognid flies.

Purulent — containing pus, as in a purulent discharge.

Range — the geographic distribution of a population or the area within which an individual animal moves (as in home range).

Raptors — synonymous with birds of prey. Birds, including hawks, owls, falcons, and eagles, that feed on flesh.

Reactivation — refers to the process by which cholinesterase enzyme activity returns to normal after carbamate exposure.

Rendering — a process by which animal carcasses are converted into fats and fertilizer.

Reptiles — coldblooded vertebrates that belong to the class Reptiles; such as., snakes, turtles, lizards.

Reservoir host — the host that maintains the disease agent in nature and that provides a source of infection to susceptible hosts.

Respiratory system — the collection of organs that provide oxygen to the organism and result in the release of carbon dioxide; typically, the trachia and lungs.

Rice breast disease — synonym for sarcocystis.

Rocket nets — remotely triggered, weighted firing devices that are propelled through the air by an explosive force carrying the netting to which they are attached over the birds or other animals being captured.

Rodenticides — toxic substances used to kill rodents.

Rodents — mammals that have chisel-like, ever growing incisor teeth that are used for gnawing; i.e., mice to beavers.

Rookery — a nesting area for some colonial birds, such as herons and egrets.

Roost sites — typically, locations where birds congregate at night in trees and other locations.

Rough fish — a term given to bottom-feeding freshwater fish with large scales, such as carp, buffalo, and similar species.

Roundworms — see nematodes.

Ruminants — hooved mammals possessing a rumen or first stomach, from which food or a cud is regurgitated for further chewing. Includes deer, elk, sheep, cattle, etc.

Salivary glands — the glands of the mouth that produce saliva.

Salt gland — see nasal gland.

Sandflies — see punkies.

Scavengers — animals that feed on dead, sick or injured prey. Includes crows, vultures, gulls, eagles, hawks, etc.

Schizogony — a type of asexual reproduction in some protozoan parasites in which daughter cells are produced by multiple nuclear divisions of the parasite (schizont).

Schizonts — the multinucleate, intermediate parasite stage that develops into merozoites within a host cell.

Scoliosis — an abnormal lateral curvature of the spine.

Sea ducks — ducks that frequent open ocean, although some species may be found on coastal bays or inland waters. Includes oldsquaw, eiders, scoters, and harlequin duck.

Secondary poisoning — intoxication of an animal as a result of eating a poisoned animal; for example, the poisoning of an eagle after it has fed on a duck that was poisoned by a chemical in treated grain. This differs from biomagnification, which involves increasing concentrations of toxic compounds within the body of organisms at increasing higher levels of a food chain.

Section 7 consultations — the Endangered Species Act requires discussion and evaluation of any proposed Federal activity, program, or permit that might affect an endangered species.

Sedated — chemically quieted.

Septicemia — the presence of pathogenic microorganisms or toxins in the blood.

Serosa — refers to the outside layer of an organ, such as the serosal surface of the intestine, or the lining of a body cavity.

Serosal surface — the external surface of an organ or a tissue within the body.

Serotype — a taxonomic subdivision of a microorganism, based on characteristic antigens or proteins.

Serovar — a taxonomic subdivision of a microorganism similar to serotype (above) but usually more specific.

Shorebirds — birds that feed at the edge of shallow water, along mudflats, and in shallow wetlands. Typically, these birds feed on invertebrates and include such species as American avocet, black-necked stilt, curlews, plovers, phalaropes, sandpipers, yellowlegs, and sanderling.

Signs — observable evidence of disease in animals (similar to symptoms in humans).

Sloughing — shedding of dead cells or dead tissue from living structures or tissues.

Slugs — terrestrial, snail-like mollusks that have a long, fleshy body and only a rudimentary shell.

Small mammals — mice to rabbits, racoons etc.; a general term used in wildlife management to group species of small to moderate size.

Small rodents — see rodents; rodents of small size, such as rats and mice.

Songbirds — small perching and singing birds, typically of the order Passeriformes, including sparrows, finches, and cardinals.

Sowbugs — see isopods.

Splenomegaly — enlargement of the spleen.

Spore — refers to a resistant stage, usually of bacteria or fungi, by which some microorganisms survive unfavorable environmental conditions and then develop into active life forms during favorable environmental conditions.

Sporogony — sporulation that involves multiple fission of a sporont (schizogony), resulting in the production of a sporocysts and sporozoites.

Sporont — a zygote of coccidian protozoa.

Sporozoite — the elongate nucleated infective stage of coccidian protozoan parasites.

Sporulation — the formation or libertion of spores.

Squab — a nestling pigeon that has not fledged.

Sternum — the breastbone.

Subcutaneous — under the skin.

Systemic — affecting the entire body.

Tapeworms — segmented parasitic flatworms; also referred to as cestodes.

Teal — small, swift-flying waterfowl of the genus `Anas`.

Tegument — the covering of an organ or the body.

Tenosynovitis — inflammation of the tendon sheath.

Teratogenic — causing embryonic deformities due to abnormal differentiation and development of cells.

Thermoregulation — regulation of the internal temperature of the body by various physiological processes.

Thorax — the part of the body between the neck and the respiratory diaphragm (in mammals), encased by the ribs.

Thorny-headed worms — acanthocephalan parasites.

Thymus gland — a lymph-gland-like organ involved in cellular immunity, located in the neck or upper thoracic cavity.

Torticollis — twisting or rotation of the neck causing an unnatural position of the head.

Toxic — poisonous.

Toxicosis — the condition of being poisoned.

Trematodes — flat, unsegmented parasitic worms; flatworms, flukes.

Trichomonids — protozoan parasites of the genus `Trichomonas`.

Trophic level — refers to an animal's position in the food chain. Species at higher trophic levels are, to a greater or lesser extent, dependent upon species in preceding trophic levels as sources of energy.

Tumor (neoplasm) — growths within organs and tissues of the body that result from the abnormal progressive multiplication of cells in a manner uncontrolled by the body.

Ubiquitous — found everywhere.

Ulceration — crater-like lesions in the skin and other tissues.

Ungulates — hoofed mammals.

Unthrifty appearance — an expression used in animal husbandry to describe an animal that is unkempt and dirty. Usually hair or feathers are soiled by excrement.

Upland gamebirds — game birds found in terrestrial habitats. Includes species such as ring-necked pheasant, quails, grouse, wild turkey, etc.

Upper digestive tract — the portion of the gastrointestinal tract that extends from the anterior opening of the esophagus in the region of the mouth to the stomach, but not including the intestines.

Ureter — the tubular structure that transports urates from the kidneys to the cloaca of birds.

Vascular system — blood circulation system.

Vector — an insect or other living organism that carries and transmits a disease agent from one animal to another.

Vegetative form — in bacteria, an active, growing, multiplying stage of development as opposed to a "spore," or a resistant resting stage.

Velogenic — refers to highly virulent strains of Newcastle disease virus that are capable of producing severe disease in the host.

Ventriculus — the stomach of a bird.

Verminous peritonitis — inflammation of the peritoneal cavity caused by parasites, usually nematodes.

Vertebrates — animals with backbones.

Viremia — the presence of virus in the blood.

Virulence — the disease-producing ability of a microorganism, generally indicated by the severity of the infection in the host and the ability of the agent to invade or cause damage or both to the host's tissues.

Virulent — the degree to which an infectious agent produces adverse effects on the host; a highly virulent organism may produce severe disease, including death.

Virus shedding — discharge of virus from body openings by way of exudate, excrement, or other body wastes or discharges.

Viscera — the internal organs, particularly of the thoracic and abdominal cavities.

Viscerotropic — possessing an affinity for visceral organs; a disease that acts primarily on the soft internal tissues of the body such as the heart, lungs, liver, and digestive tract.

Voluntary muscle — muscle normally under control of the individual.

Voucher specimen — specimens deposited in scientific collections that are representative of a species or a subgrouping of a species.

Wading birds — long-necked, long-legged birds that feed by wading in wetlands and catching prey with their bills. Includes egrets, herons, ibises, roseate spoonbills, flamingos, and bitterns.

Waterbirds — birds that require aquatic habitat.

Waterfowl — species of the Family Anatidae; ducks, geese, and swans. Does not include American coot.

Whistling ducks — the fulvous whistling duck or the tropical black-bellied tree duck.

Yeasts — single-celled, usually rounded fungi that produce by budding.

Zooplankton — minute animal organisms that in combination with counterparts from the plant kingdom constitute the plankton (minute free-floating organisms) of natural waters.

Zygote — a cell resulting from the union of a male and a female gamete, until it divides; the fertilized ovum.

Index

A

Acanthocephaliasis 189, 241–243
Acanths, see Acanthocephaliasis
Acaricides 285
Acid precipitation 339
Aflatoxicosis, see Aflatoxin poisoning
Aflatoxin poisoning 129, 260, 267–269
Agricultural waste 131
Air, gasping for 105
Air sacs, cheesy plaques in 131–132
Alachlor 285
Albatross
  plastic debris in stomach of 363
  tick paralysis in 258
Alcids, chlamydiosis in 111
Aldicarb 285, 287, 292, 351
Aldrin 295–297, 303
Algacides 285
Algal bloom 261, 263–264
Algal toxins 261, 263–266
Alkali poisoning, see Avian botulism
Allergic disease 128
All-terrain vehicle 21, 27
  disinfection of 33
  transport of live animals in 64–65
American avocet, lead poisoning in 320
American black duck
  duck plague in 143
  sarcocystis in 220
American coot
  algal toxin poisoning in 264
  aspergillosis in 130
  gizzard worms in 236
  lead poisoning in 320
  salmonellosis in 103
  trematodes in 251, 253
American egret, chlamydiosis in 112
American goldeneye, avian pox in 163
American goldfinch, mycoplasmosis in 115
American kestrel
  chlorinated hydrocarbon poisoning in 296
  staphylococcosis in 123
American wigeon
  algal toxin poisoning in 264
  nasal leeches in 245
  sarcocystis in 220
American woodcock, woodcock reovirus
  disease in 185–186
Amidostomiasis, see Gizzard worms
Amidostomum, see Gizzard worms
Amphibians, Eustrongylides in 223–224
Analytical laboratories 371–372
Anatoxin 263, 265
Anemia 195, 207–208, 231, 257–258, 309–310
Anesthesia
  as chemical restraint 58
  euthanasia with inhalant anesthetics 50
Animal Care and Use Committees, institutional 54
Animal containers 65–66
Animal lists 19
Animal marking 44, 61–63
  criteria for 61–62
  professional and ethical considerations in 62–63
Animal population data 19, 22
Animal release guidelines 70
Animal relocation 32–34, 69
Animal Welfare Act (1985) 53–54, 71
Anoxia 344
Antimycin 285
Apapane, hemosporidiosis in 194, 196–197
Appearance, unthrifty 95, 105, 208, 257
Appetite, loss of 118, 154, 195, 223, 268
Arbovirus 171
Aroclor® 303, 305
Arsenic 285
Arthritis 107, 185
Ascites 172
Aspergillosis 96, 127–133
Aspergillus, see Aspergillosis
Aspergillus flavus, see Aflatoxin poisoning
Aspergillus niger 137
Aspergillus parasiticus, see Aflatoxin poisoning
Asper mycosis, see Aspergillosis
Asphyxiation 129
Ataxia 172, 177, 290
Atrazine 285
Auk
  avian cholera in 79
  oil toxicosis in 311
Avian botulism 4, 55, 74, 260, 271–281
Avian cholera 74–92
Avian diphtheria, see Avian pox
Avian hemorrhagic septicemia, see Avian cholera
Avian influenza 140, 181–184

Avian malaria, see Hemosporidiosis
Avian pasteurellosis, see Avian cholera
Avian pox 140, 163–169
Avian trichomoniasis, see Trichomoniasis
Avicides 285
Avitrol® 285
Azinphos-methyl 287

B

Bacillary white diarrhea, see Salmonellosis
Bacterial diseases 74
Bald eagle
  avian pox in 163, 165, 168
  barbiturate poisoning in 349–350
  chlorinated hydrocarbon poisoning in 296, 298
  cyanide poisoning in 342
  electrocution of 359
  eustrongylidiosis in 225
  herpesvirus disease in 159
  lead poisoning in 317, 319–321
  mercury poisoning in 338–339
  oil toxicosis in 314
  pesticide poisoning in 292
  scoliosis in 355, 367
  staphylococcosis in 123
Ballast waters 264
Band-tailed pigeon, trichomoniasis in 201, 203
Barbiturate poisoning 349–350, 353
Barn owl, chlorinated hydrocarbon poisoning in 296
Barred owl, avian pox in 165
Bay ducks
  lead poisoning in 318
  oil toxicosis in 311
Bayluscide® 285
Bean goose, heartworm of swans and geese in 234
Beaver, tularemia in 124
Behavior, altered 290
Benzene hexachloride 303
Beuthanasia-D Special® 51
Bewick's swan, heartworm of swans and geese in 234
Big game, Pasteurella multocida in 77
Bill
  blood-stained 146
  cheesy lesions around 203
  discharge from 122, 319
  rapid opening and closing of 131
  scratching at 245
Bioaccumulation 295
Biomagnification 295
Biotoxins 260–261
Bird banding activity 109, 123
Bird feeding stations 100, 103–105, 107–109, 116, 119, 130–131, 164–165, 202–203, 206
Birds of prey
  acanthocephaliasis in 242
  avian cholera in 75
  eustrongylidiosis in 223
  mycoplasmosis in 115–116
  trichomoniasis in 203, 206
  tuberculosis in 93–94
Bird tick 257
Biting fly 193
Biting louse 233–234
Biting midge 193, 195
Bittern, oil toxicosis in 311
Blackbird
  aspergillosis in 130
  erysipelas in 121
  pesticide poisoning in 288
  salmonellosis in 100, 103
Black-crowned night heron, mercury poisoning in 338
Black duck
  aflatoxin poisoning in 267
  chlorinated hydrocarbon poisoning in 301
  duck plague in 143–144
  lead poisoning in 321
  mercury poisoning in 340
  necrotic enteritis in 122
  trematodes in 249
Black fly 193–195
Black-footed albatross, chlorinated hydrocarbon poisoning in 295
Black-footed penguin, herpesvirus disease in 159
Blackhead, see Histomoniasis
Black-necked stilt, lead poisoning in 320
Blindness 105, 118, 247, 267, 290
Blood, thin and watery 195, 197
Blood lead level 323, 332
Blood sample 8
  collection from live animals 57–59
  shipment of blood tubes 14–15
Blood smear, in hemosporidiosis 198
Bluebird, pesticide poisoning in 288
Blue-green bloom 261
Blue grouse, tularemia in 124
Blue jay
  chlorinated hydrocarbon poisoning in 296
  mycoplasmosis in 119
Blue-winged teal
  aflatoxin poisoning in 267
  avian pox in 164
  chlorinated hydrocarbon poisoning in 296
  duck plague in 141
  trematodes in 249
Bobwhite quail
  avian pox in 164, 169
  chlorinated hydrocarbon poisoning in 297, 301
  gizzard worms in 236

herpesvirus disease in 159
histomoniasis in 257
lead poisoning in 320, 333
polychlorinated biphenyl poisoning in 305
tularemia in 124
Body temperature, reduced ability to regulate 290
Bomyl® 285
Booted eagle, herpesvirus disease in 159
Botulinum toxin 271–281
Botulism, avian, see Avian botulism
Brachial vein, blood collection from live animals 57
Brain
cholinesterase levels in 375–376
reddening of surface of 348
Brandt's cormorant, algal toxin poisoning in 264
Brant's goose, lead poisoning in 318
Breathing
impaired 165, 168, 195, 223, 247, 290
rapid 105, 290
Brevetoxin 263–265
Broadifacoum 285
Brolga crane, inclusion body disease of cranes in 153
Brooder pneumonia, see Aspergillosis
Brown-headed cowbird
polychlorinated biphenyl poisoning in 305
salmonellosis in 104
Brown pelican
algal toxin poisoning in 264–265
erysipelas in 121
lead poisoning in 317, 321
mercury poisoning in 338
oil toxicosis in 311
Budgerigar, candidiasis in 135
Bufflehead, nasal leeches in 245
Buildings, collisions with 365
Bullfinch, avian pox in 169
Bumblefoot 123
Burial of carcasses 21, 32
Burn marks 359–360
Bursa of Fabricus, atrophy of 305–306
Buteo, electrocution of 357
Buzzard, tuberculosis in 93–94

C

Cadmium 285
California gull, lead poisoning in 320
California herring gull, Newcastle disease in 175
California quail, chlorinated hydrocarbon poisoning in 297
Call, change in tone of 319
Canada goose
aflatoxin poisoning in 267–268
aspergillosis in 130
avian cholera in 81, 91
avian pox in 163–164
caught in plastic debris 363
chlorinated hydrocarbon poisoning in 296–297
duck plague in 141, 143, 146
gizzard worms in 236, 238
heartworm of swans and geese in 234
histomoniasis in 257
ingestion of dry soybeans 356
lead poisoning in 317–319, 321, 324, 327, 331, 333
necrotic enteritis in 122
oil toxicosis in 313–314
transport of live animals 66
tumor in 364
weather-related losses of 366
Canary
erysipelas in 121
herpesvirus disease in 159
salmonellosis in 100
Candida albicans, see Candidiasis
Candidiasis 128, 135–136
Canker, see Trichomoniasis
Cannon net 35
Canvasback
gizzard worms in 236
nasal leeches in 245
oil toxicosis in 311
Cape cormorant, avian cholera in 81
Captan 285
Captive-reared animals, release of 70
Capture devices 33, 35–36
Capture myopathy 58, 60, 364
Carbamate pesticides 4, 287–293, 351
Carbaryl 287
Carbofuran 285, 287, 289, 292, 351
Carbon dioxide, euthanasia with 50–51
Carbon dioxide projected dart 61
Carbon-in-pulp mill process 342, 345
Carbon monoxide, euthanasia with 50–51
Carcass, see also Specimen
disposal of 21–32, 43
dogs to aid in locating 21
euthanized, barbiturate poisoning in scavengers 349–350
fish 280
labeling of 12
lines of dead birds 276, 278
removal of 21, 41, 43
plastic bags/containers 21, 25, 43
specimen to submit to laboratory 7
transport of 21, 25
vertebrate 272, 279–280
Carcass-maggot cycle, of avian botulism 272–273, 279
Carnivores
Pasteurella multocida in 77
Sarcocystis in 219–222

Cassin's finch, salmonellosis in 104
Castor beans 261, 356
Cat(s), Mycobacterium avium in 93
Catalogued collections 56–58
Cattle, see Livestock
Cecal cores 257
Cedar waxwing
  avian cholera in 80
  salmonellosis in 104
Ceratopagonid fly 193–195
Cervical dislocation, as euthanasia method 49–50
Cestodes 189, 254
Cheilospirura spinosa, see Gizzard worms
Chemical euthanasia 50–51
Chemical ice pack 14
Chemical names 382–384
Chemical restraint 58, 61
Chemical toxins 284–285
  miscellaneous 351–353
  sources of assistance for investigating mortality events 370–372
Chestnut-backed chickadee, salmonellosis in 104
Chicken
  aspergillosis in 130
  avian botulism in 275
  avian cholera in 82
  avian influenza in 181, 183
  avian pox in 165
  candidiasis in 135
  erysipelas in 121
  herpesvirus disease in 157–158
  histomoniasis in 257
  inclusion body disease of cranes in 153–154
  intestinal coccidiosis in 210
  mycoplasmosis in 115–116
  nematodes in 255
  Newcastle disease in 175–179
  new duck disease in 122
  salmonellosis in 100
  ticks on 257
  tracheal worms in 229
  trichomoniasis in 203
  tuberculosis in 94
  ulcerative enteritis in 123
Chipping sparrow, salmonellosis in 104
Chlamydia psittaci, see Chlamydiosis
Chlamydiosis 74, 111–114
Chlordane 296–297, 301, 303
Chloride poisoning 353
Chlorinated hydrocarbon poisoning 295–302, 352
Chlorine 285
Chlorine bleach 33–34
Chlorophacinone 285
Chlorpyrifos 289, 292, 352
Choke cherry 261
Cholera, avian, see Avian cholera
Cholinesterase, brain levels, normal values 375–376
Cholinesterase inhibitors 287–293
Chromium 285
Chronic respiratory disease, see Mycoplasmosis
Chukar partridge
  chlorinated hydrocarbon poisoning in 296–297
  eastern equine encephalomyelitis in 171
  mercury poisoning in 338
  mycoplasmosis in 117–118
  tuberculosis in 96
  ulcerative enteritis in 122
Ciguatoxin 264
Circular movements, involuntary 172
Cloaca, cheesy plaques in 151
Cloacotaenia 254
Clophens® 305
Clostridial enterotoxemia 74
Clostridium botulinum, see Avian botulism
Clostridium colinum, see Ulcerative enteritis
Clostridium perfringens, see Necrotic enteritis
Closure of area 33–34
Clothing, protective, see Protective clothing
Coccidian 189
Coccidiasis, see Intestinal coccidiosis
Coccidiosis
  intestinal, see Intestinal coccidiosis
  renal, see Renal coccidiosis
Cockatiel, chlamydiosis in 111
Cold stress, reduced tolerance to 290
Colibacillosis 125–126
Colonial nesting birds
  avian pox in 164
  salmonellosis in 99, 103–105
Comatose bird 349
Common buzzard, herpesvirus disease in 159
Common crane, inclusion body disease of cranes in 153–154
Common egret
  chlamydiosis in 114
  eustrongylidiosis in 225
  mercury poisoning in 338
Common eider
  acanthocephaliasis in 242
  intestinal coccidiosis in 211
  lead poisoning in 317
Common goldeneye, avian pox in 164
Common loon
  lead poisoning in 317, 320–321
  mercury poisoning in 338
Common merganser
  erysipelas in 121

mercury poisoning in 338
Common moorhen, trematodes in 252
Common murre
algal toxin poisoning in 264
avian pox in 164, 169
Common names of wildlife 377–381
Common scoter, avian pox in 164
Common tern
algal toxin poisoning in 264
avian influenza in 183
mercury poisoning in 338–339
Composting of carcasses 21, 32–33
Conjunctivitis, herpesvirus 158
Contagious epithelioma, see Avian pox
Conversion table, of units of measurement 385–386
Convulsions 83, 85, 105, 107, 146, 208, 265, 290, 298, 300, 306
Cooper's hawk, chlorinated hydrocarbon poisoning in 296
Coot
avian cholera in 78–81, 91
chlorinated hydrocarbon poisoning in 296
gizzard worms in 236–237
inclusion body disease of cranes in 153
lead poisoning in 319
mycoplasmosis in 117
pesticide poisoning in 288
salmonellosis in 100, 103
selenium poisoning in 335
trematodes in 249, 252
Copper 285
Copper sulfate 285
Cormorant
avian cholera in 79
chlorinated hydrocarbon poisoning in 298
erysipelas in 121
eustrongylidiosis in 225
herpesvirus disease in 158–159
mercury poisoning in 338
Newcastle disease in 175–176
oil toxicosis in 311
polychlorinated biphenyl poisoning in 303
renal coccidiosis in 216
salmonellosis in 100, 103
Corn
aflatoxin in 267–268
fusariotoxin in 269
Cornea, cloudy 247
Coturnix quail, polychlorinated biphenyl poisoning in 303
Coughing 231
Coumaphos 352
Counter® 285
Cowbird
aspergillosis in 130
salmonellosis in 103
Cracker shell 32, 34
Crane
avian cholera in 79–80
avian influenza in 181
capture myopathy in 364
chemical poisoning in 353
chlamydiosis in 112
disseminated visceral coccidiosis of cranes in 207, 212
eastern equine encephalomyelitis in 171–173
erysipelas in 121
herpesvirus disease in 157–159
inclusion body disease of cranes in 140, 153–156
intestinal coccidiosis in 207, 210–211
lead poisoning in 319
oil toxicosis in 311
organophosphate poisoning in 352
salmonellosis in 100, 103
tuberculosis in 93–94
Crane herpes, see Inclusion body disease of cranes
Crop, sour, see Candidiasis
Crow
aspergillosis in 130
avian cholera in 78–80, 85, 91
candidiasis in 135
carbamate poisoning in 351
chemical poisoning in 353
erysipelas in 121
organophosphate poisoning in 352
pesticide poisoning in 288
rodenticide and repellent poisoning in 353
salmonellosis in 103
tuberculosis in 93–94
Crustaceans, acanthocephalans in 242
Cryptosporidium, see Intestinal coccidiosis
Curlew, salmonellosis in 100
Cyanide poisoning 261, 341–345, 353
Cyanobacterial bloom 263, 265
Cyanobacterial toxins 264
Cyanosis 257
Cyathocotyle buchiensis 249–251
Cyathostoma bronchialis, see Tracheal worms
Cylindrospermopsin 264

D

Dabbling ducks, sarcocystis in 220
Dactylaria gallopova 137
Daphnia, as nematode host 255
DDD 295–296
DDE 295, 298, 300
DDT 287, 296–298, 301
Decapitation 50
Deer, Mycobacterium avium in 93
Definitive host 188

Deformity 306, 335, 367
Dehydration 207–208, 250
Demeton 285
Demoiselle crane, inclusion body disease of cranes in 153
Deoxynivalenol 269
Depression 105, 118, 122, 157, 172, 257, 267, 300
Diacetoxyscirpenol 269
Diagnostic assistance, sources of 370–372
Diarrhea 95, 105, 122, 172, 290
  bright green 319
  greenish 122
  rust-colored 112
  watery 208
Diazinon 285, 289, 292, 351–352
Dicrotophos 292
Dieldrin 287, 295–297, 300–301, 303, 352
Die-off, description of location of 5–6
Digestive tract, see Gastrointestinal tract; Intestine
Dimethoate 287, 292, 352
Dinoflagellate bloom 259, 263
Diphacinone 285
Diphtheria, avian, see Avian pox
Diquat® 285
Direct life cycle 188–190
Disease control operations
  analyses 42
  disease outbreak summary 48
  field communications systems 44
  during field research 67–69
  planning phase of
  biological data records 19, 22–23, 41
  identification of needs 19–20, 41
  response activities
  animal relocation 32–34
  carcass disposal 21–32, 43
  carcass removal 21, 41, 43
  disinfection 33–34, 38–39, 43
  establishing control of area 41
  personnel for 34, 40
  problem identification 21, 41
  response modifications 40
  for specific diseases
  for acanthocephaliasis 243
  for aflatoxin poisoning 268
  for algal toxins 266
  for aspergillosis 131
  for avian botulism 279–280
  for avian cholera 88–91
  for avian influenza 184
  for avian pox 169
  for barbiturate poisoning 350
  for chlamydiosis 113
  for chlorinated hydrocarbon poisoning 302
  for cyanide poisoning 345
  for duck plague 39, 151
  for eastern equine encephalomyelitis 174
  in electrocutions 360
  for eustrongylidiosis 225
  for fusariotoxin poisoning 270
  for gizzard worms 239
  for hemosporidiosis 199
  for herpesvirus disease 160
  for inclusion body disease of cranes 154–156
  for intestinal coccidiosis 211–213
  for lead poisoning 332–333
  for mercury poisoning 340
  for mycoplasmosis 119
  for nasal leeches 248
  for Newcastle disease 178–179
  for oil toxicosis 313–314
  for pesticide poisoning 292–293
  for polychlorinated biphenyl poisoning 306–307
  for renal coccidiosis 218
  for salmonellosis 107–109
  for salt poisoning 348
  for sarcocystis 221–222
  for selenium poisoning 336
  for tracheal worms 231
  for trichomoniasis 206
  for tuberculosis 95–96
  for woodcock reovirus disease 186
  station disease contingency plan 45–47
  surveillance activities 42, 44
  wildlife population and habitat management 44
  wildlife sampling and monitoring 44
Disease introduction 67–69
Disease onset, estimation of 4
Disinfectant 33–34
Disinfection 33–34, 38–39, 43
Dissection of bird 10–11
Disseminated visceral coccidiosis of cranes 207, 212
Disulfoton 292, 352
Diving birds
  mercury poisoning in 338
  oil toxicosis in 311
Diving ducks
  aspergillosis in 130
  gizzard worms in 237
  lead poisoning in 318, 332
  nasal leeches in 245
  pesticide poisoning in 288
  sarcocystis in 221
  trematodes in 249
Dog
  location of carcasses by 21
  Mycobacterium avium in 93
Domestic animal disease programs 370
Domoic acid 263–265

Double-crested cormorant
entangled in fishing line 362
lead poisoning in 320–321
mercury poisoning in 338
Newcastle disease in 175–178
polychlorinated biphenyl poisoning in 303
renal coccidiosis in 217
salmonellosis in 103
Dove
avian cholera in 79
carbamate poisoning in 351
chemical poisoning in 353
chlamydiosis in 111
erysipelas in 121
hemosporidiosis in 194
herpesvirus disease in 158
intestinal coccidiosis in 210
lead poisoning in 319, 332–333
Newcastle disease in 176
organophosphate poisoning in 352
pesticide poisoning in 288
salmonellosis in 103
trichomoniasis in 201–203, 206
Drive trap 36
Droopiness 105, 122, 146
Drop net 33
Droppings
blood-stained 83
fawn-colored or yellow 83
Drowning 148, 277–279, 309–310, 356, 367
Drowsiness 83, 172, 349
Dry ice
euthanasia with 51
for specimen shipment 14, 17
Duck
acanthocephaliasis in 242
aflatoxin poisoning in 267
algal toxin poisoning in 264
aspergillosis in 130
avian botulism in 277
avian cholera in 78–79
candidiasis in 135
chlamydiosis in 111, 114
chlorinated hydrocarbon poisoning in 296
duck hepatitis in 361
duck plague in 141–151
erysipelas in 121
gizzard worms in 236–237
hemosporidiosis in 194–195
herpesvirus disease in 157
intestinal coccidiosis in 210
lead poisoning in 318
mycoplasmosis in 115, 117
nasal leeches in 248
necrotic enteritis in 122
nematodes in 255
Newcastle disease in 175
new duck disease in 122
oil toxicosis in 311
renal coccidiosis in 216–217
rictin poisoning in 356
salmonellosis in 100, 103, 107
salt encrustation of 347
staphylococcosis in 123
tracheal worms in 229
tularemia in 124
Duck disease, see Avian botulism
Duck hepatitis 361–362
Duck leeches, see Nasal leeches
Duck plague 39, 140–151
Duck virus enteritis, see Duck plague
Dung piles 101
Dusky song sparrow, salmonellosis in 104
DVE, see Duck plague

E

Eagle
avian cholera in 78–79, 91
carbamate poisoning in 351
chemical poisoning in 353
chlorinated hydrocarbon poisoning in 352
cyanide poisoning in 342
electrocution of 357
erysipelas in 121
herpesvirus disease in 158
lead poisoning in 317, 322
organophosphate poisoning in 352
pesticide poisoning in 288
rodenticide and repellent poisoning in 353
salmonellosis in 100
staphylococcosis in 123
strychnine poisoning in 351
tularemia in 124
Eagle owl, herpesvirus disease in 159
Eared grebe
algal toxin poisoning in 264
erysipelas in 121
salmonellosis in 103
Earthworms
chlorinated hydrocarbons in 295
histomonads in 257
tracheal worm carriage 229–230
East African crowned crane, inclusion body disease of cranes in 153
Eastern equine encephalomyelitis 140, 171–174
Eastern screech owl, avian pox in 165
Eastern sleeping sickness of horses, see Eastern equine encephalomyelitis

Echinuria uncinata 255–256
Ectoparasites 188, 249, 257–258
Edema 305–306, 344
EEE, see Eastern equine encephalomyelitis
Egg production, decreased 183
Eggshell, thin 298–300, 303, 306
Egret
  avian cholera in 79
  chemical poisoning in 353
  chlamydiosis in 112
  chlorinated hydrocarbon poisoning in 298
  eustrongylidiosis in 225
  lead poisoning in 321
  oil toxicosis in 311
  salmonellosis in 99–100, 103
Eider
  aspergillosis in 131
  avian cholera in 80, 82, 91
  oil toxicosis in 311
  renal coccidiosis in 217
Eimeria, see Intestinal coccidiosis; Renal coccidiosis
Electrocution 356–360
Emaciation 95, 131, 165, 185–186, 195, 208, 217, 223, 237, 242, 256, 298, 301, 305, 312, 319, 339
Embryo mortality 306, 335
Embryonic deformity 335
Emerging infectious disease 140
Emu, eastern equine encephalomyelitis in 171
Encephalomyelitis 158
Endoparasites 188, 249
Endosulfan 297
Endrin 295–297, 301
Enflurane 50
English sparrow, salmonellosis in 104, 106
Enteritis 211, 249
  duck virus, see Duck plague
  necrotic, see Necrotic enteritis
  ulcerative, see Ulcerative enteritis
  woodcock reovirus 185
Environmental factors, records of 4
Epithelioma, contagious, see Avian pox
Epizootiology 3
Epomidiostomum, see Gizzard worms
Erysipelas 121
Erysipilothrix rhusopathiae, see Erysipelas
Escherichia coli, see Colibacillosis
Esophagus
  cheesy, raised plaques along 146, 150–151
  hard, cheesy lesions of 205
  impaction of 320, 328–329
  light-colored granulomas in 211–212
  yellow, cheesy nodules in 106
Ethion 287
Ethylene glycol poisoning 285, 353
European blackbird, erysipelas in 121
European bullfinch, salmonellosis in 100
European jay, aspergillosis in 130
European starling
  mycoplasmosis in 116, 118
  polychlorinated biphenyl poisoning in 305
  salmonellosis in 103
European thrush, acanthocephaliasis in 242
Eustrongylides, see Eustrongylidiosis
Eustrongylidiosis 223–228
Euthanasia 7, 32, 49–51
  chemical 50–51
  guidelines for field research 54, 67, 70
  physical 49–50
  selection of method of 49
Euthanasia agents 50–51, 285
  barbiturate poisoning of scavengers 349–350
Eutrophication 225, 261
Evening grosbeak, salmonellosis in 104, 106
Exertional myopathy, see Capture myopathy
Exhaustion 309–310
Exsanguination 50
Eye
  cheesy plaques in 131
  discharge from 112, 122
  drainage from 118
  erosions on surface of 348
  inflamed 118
  leeches in 245, 247
  protrusion of 290
  puffy 118
  swollen 118
Eyelids
  crusty 118
  drooping of 290, 339
  paralysis of 277–278
  pasted 105
  swollen 118

F

Face, puffy 203–204
Falcon
  avian cholera in 78–79
  electrocution of 357
  herpesvirus disease in 157–159
  intestinal coccidiosis in 210
  pesticide poisoning in 288
  salmonellosis in 100, 103
  trichomoniasis in 203
  tuberculosis in 93
Famphur 289, 292, 351–352
Favus, fowl, see Ringworm
Feathers
  burn marks on 359

loss of 137, 258
oil contamination of 309–310, 312
ruffled 105, 112, 122, 135, 183, 257, 339
Feces
bile-stained 319
green-colored 319, 325
Feeding difficulties 112, 165
Fenamiphos 292
Fences, collisions with 365
Fenclors® 305
Fensulfothion 292
Fenthion 285, 289, 292, 352
Ferruginous hawk
avian pox in 165
staphylococcosis in 123
"Field hospital," for waterfowl 55
Field research
animal disposal at completion of study 70
animal marking 61–63
blood and tissue collections 57–59
conditions for confined wildlife 54–55, 63–64
disease considerations 67–69
euthanasia 67, 70
housing and maintenance of field sites 54–55, 63–64
investigator disturbance and impacts 56
professional society guidelines for 71
restraint and handling of wildlife 58–60
safety of personnel 70
surgical and medical procedures 65–67
transport of live animals 64–65
wildlife in 53–71
wildlife observations and collections 56–58
Wildlife Society guidelines for 53–71
Filarial heartworm, see Heartworm of swans and geese
Finch
avian cholera in 79
avian pox in 164
erysipelas in 121
herpesvirus disease in 159
Fish
acanthocephalans in 242
Eustrongylides in 223–225
mercury in 339
Pfiesteria mortality in 265
Fish-eating birds
chlorinated hydrocarbon poisoning in 295
eustrongylidiosis in 225
polychlorinated biphenyl poisoning in 303
renal coccidiosis in 216
Fishing line, discarded 362
Fishing sinkers 333
Flamingo
capture myopathy in 364
lead poisoning in 320
Flea 258
Flight
awkward 265
erratic 83, 319
inability to fly 146, 148, 267, 277–278, 309
reluctance to fly 318
Flukes, see Trematodes
Fluorine poisoning 353
Fly 258
Fly larvae, tracheal worm carriage 229–230
Fonofos 292, 352
Food chain 295, 303, 337
Foot webs, congestion in 265
Formalin 8
Fowl cholera, see Avian cholera
Fowl favus, see Ringworm
Fowl pest, see Avian influenza
Fowl plague, see Avian influenza
Fowl pox, see Avian pox
Fowl tick 257
Fowl typhoid, see Salmonellosis
Francisella tularensis, see Tularemia
Franklin's gull, algal toxin poisoning in 264
Frogs, acanthocephalans in 242
Frounce, see Trichomoniasis
Fulmar, mercury poisoning in 338
Fulvous whistling duck, chlorinated hydrocarbon poisoning in 296–297
Fungal disease 128
cutaneous 137
miscellaneous 137
subcutaneous 137
systemic 137
Fungicides 285
Funnel trap 35–36
Fusariomycotoxicosis, see Fusariotoxin poisoning
Fusariotoxin poisoning 269–270
Fusarium, see Fusariotoxin poisoning

G

Gadwall
aflatoxin poisoning in 267
duck plague in 141
nasal leeches in 245
sarcocystis in 220
Gait
abnormal 112
unsteady 319
Gallbladder, distended and bile-filled 320, 330
Gallinaceous birds
chlorinated hydrocarbon poisoning in 296, 298
mercury poisoning in 338
Gannet
mercury poisoning in 338

Newcastle disease in 177
salmonellosis in 103
Gapes, see Tracheal worms
Gape worm, see Tracheal worms
Gaping 131, 229, 247
Gastiotaenia 254
Gastrointestinal tract, see also Intestine
dye in 291
hemorrhage in 146, 149, 151, 269, 309
inflammation and ulceration of 269–270
inflammation of 310
moist, necrotic lesions of 165
Geographic distribution
of aflatoxin poisoning 267–269
of aspergillosis 130
of avian botulism 275–277
of avian cholera 76, 80–84
of avian influenza 182–183
of avian pox 164–166
of candidiasis 135
of chlamydiosis 111
of chlorinated hydrocarbon poisoning 295
of cyanide poisoning 342–344
of duck plague 141–145
of eastern equine encephalomyelitis 171
of electrocutions 358
of eustrongylidiosis 223, 226–227
of fusariotoxin poisoning 269
of heartworm of swans and geese 234
of hemosporidiosis 195
of herpesvirus disease 157, 159
of inclusion body disease of cranes 153–154
of intestinal coccidiosis 208, 210
of lead poisoning 322–323, 333
of mercury poisoning 339
of mycoplasmosis 117
of nasal leeches 245–246
of Newcastle disease 176–178
of oil toxicosis 311–312
of pesticide poisoning 289
of polychlorinated biphenyl poisoning 303–305
of renal coccidiosis 217
of salmonellosis 100, 104
of salt poisoning 347
of sarcocystis 220
of selenium poisoning 335
of tracheal worms 229
of trichomoniasis 201, 203–204
of tuberculosis 94
of woodcock reovirus disease 185
Gizzard
green-stained 320, 330
hemorrhages on surface of 83
lead pellets in 320, 331
Gizzard pads, inflammation of 254
Gizzard worms 235–239
Glaucous-winged gull, lead poisoning in 320
Globe, collapse of 247
Glossy ibis, eastern equine encephalomyelitis in 171
Gloves 7, 21
disposable and reusable 21, 24
Goats, see Livestock
Golden eagle
avian pox in 165
barbiturate poisoning in 349–350
electrocution of 357–358
herpesvirus disease in 159
lead poisoning in 317, 319–320
mercury poisoning in 338–339
staphylococcosis in 123
Goldfinch, salmonellosis in 100, 104
Gold mining 341–345
Goose
acanthocephaliasis in 242
algal toxin poisoning in 264
avian cholera in 79
candidiasis in 135
chlamydiosis in 111
duck plague in 141–151
erysipelas in 121
fusariotoxin poisoning in 269
gizzard worms in 236–237
heartworm of swans and geese in 233–234
hemosporidiosis in 194–195
intestinal coccidiosis in 210
lead poisoning in 318
mycoplasmosis in 115
nasal leeches in 245
nematodes in 254–255
oil toxicosis in 311
pesticide poisoning in 288
renal coccidiosis in 216–217
salmonellosis in 100, 103
sarcocystis in 221
tracheal worms in 229
tularemia in 124
Goshawk
chlorinated hydrocarbon poisoning in 296
mercury poisoning in 339
Gout 367
visceral 172–173, 348
Grackle
aspergillosis in 130
avian cholera in 79–80
salmonellosis in 103
Grain
aflatoxin in 267
drugged, to capture birds 36

fusariotoxin in 269–270
mercury-treated 339
moldy 129, 131
Grain storage facility 206
Granuloma 131, 225
Grasshopper, gizzard worm carriage 236, 239
Gray partridge, chlorinated hydrocarbon poisoning in 297
Great blue heron
eustrongylidiosis in 223, 226
lead poisoning in 320–321
mercury poisoning in 338
Great cormorant, algal toxin poisoning in 264
Great egret
eustrongylidiosis in 225
lead poisoning in 320
Greater sandhill crane, lead poisoning in 320
Great horned owl
chlorinated hydrocarbon poisoning in 296
electrocution of 357
herpesvirus disease in 159–160
Grebe
avian cholera in 79
chemical poisoning in 353
chlorinated hydrocarbon poisoning in 296
erysipelas in 121
gizzard worms in 236
nasal leeches in 245
oil toxicosis in 311
Green-winged teal
aflatoxin poisoning in 267
avian botulism in 281
avian pox in 163–164
erysipelas in 121
trematodes in 249
Grinding pads, degeneration of 237–238
Grouse
candidiasis in 135
gizzard worms in 235
histomoniasis in 257
lead poisoning in 317, 319, 332
mercury poisoning in 338
nematodes in 254–255
salmonellosis in 100, 103
tularemia in 124
ulcerative enteritis in 123
Growth retardation 135
Guillemot
oil toxicosis in 311
salmonellosis in 103
Guinea fowl
candidiasis in 135
duck hepatitis in 361
erysipelas in 121
herpesvirus disease in 157
mycoplasmosis in 115–116
nematodes in 255
salmonellosis in 100
Gull
algal toxin poisoning in 264
aspergillosis in 130
avian botulism in 274
avian cholera in 78–80, 91
avian influenza in 181, 183
candidiasis in 135
capture myopathy in 364
carbamate poisoning in 351
chemical poisoning in 353
chlamydiosis in 111–112
chlorinated hydrocarbon poisoning in 298
eastern equine encephalomyelitis in 171–172
erysipelas in 121
gizzard worms in 237
intestinal coccidiosis in 210
lead poisoning in 319, 321
mercury poisoning in 338
oil toxicosis in 311
pesticide poisoning in 288
renal coccidiosis in 216
salmonellosis in 99–100, 103–104, 107
sarcocystis in 221
tuberculosis in 93–94
tularemia in 124
Gunshot, as euthanasia method 50, 56
Gyrfalcon, herpesvirus disease in 159

H

Haemoproteus, see Hemosporidiosis
Halothane 50
Handling of live animals 58–60
disease due to 364
Harlequin duck, avian pox in 164
Hatchet-breast appearance 319, 325
Hatchlings, disease in 361
Hawaiian forest birds
avian pox in 166
hemosporidiosis in 195
Hawaiian goose, avian pox in 163
Hawk
avian cholera in 79
carbamate poisoning in 351
chemical poisoning in 353
erysipelas in 121
intestinal coccidiosis in 210
lead poisoning in 319
organophosphate poisoning in 352
pesticide poisoning in 288
rodenticide and repellent poisoning in 353
salmonellosis in 100, 103

trichomoniasis in 203
tuberculosis in 94
tularemia in 124
Hawk-headed parrot, salmonellosis in 100
Hazardous Materials Regulations 17
Hazing 32
Head
arched back 290
fluid beneath skin of 269–270
inability to hold erect 277
puffy or swollen 319, 327
pulled back and twisted to side 148
resting on back 83, 85
shaking of 157, 223, 231, 245
side-to-side movement of 265
twisting of 177–179, 265
unnatural positioning of 131
Head droop 265, 269
Head restraint 59
Heap leach system 341–345
Heart
enlarged 234
excess fluids around 305
fibrinous covering on surface of 122
hemorrhage on surface of 83, 86–87, 146, 150
light patches on 211, 213
pale foci or spots on 234
Heartworm 188
Heartworm of swans and geese 233–234
Hemorrhage
in gastrointestinal tract 146, 149, 151, 269, 309
on gizzard surface 83
on heart surface 83, 86–87, 146, 150
in intestine 154, 249–251, 268, 291, 293
in liver 265, 268, 361
in thymus gland 154
trauma-related 366
Hemorrhagic septicemia, avian, see Avian cholera
Hemosporidiosis 187–189, 193–199
Hemozoin pigment 195, 199
Hepatitis
duck, see Duck hepatitis
herpesvirus 157–158
woodcock reovirus 185
Hepatomegaly 112–113, 172
Heptachlor 296–297, 301, 352
Herbicides 285
Heron
aspergillosis in 130
avian botulism in 274
avian cholera in 79
chlamydiosis in 111–112
chlorinated hydrocarbon poisoning in 298
eustrongylidiosis in 225
oil toxicosis in 311
salmonellosis in 99–100, 103
Herpesvirus
duck plague 141–151
inclusion body disease of cranes 153–156
Herpesvirus disease 157–161
Herring gull
algal toxin poisoning in 264
aspergillosis in 131
avian influenza in 183
erysipelas in 121
lead poisoning in 320
mercury poisoning in 338
oil toxicosis in 314
salmonellosis in 99
staphylococcosis in 123
Heterakis gallinarum, as vector for Histomonas 257
Hexaconazole 285
High voltage transmission lines 357–360
Histomonas meleagridis, see Histomoniasis
Histomoniasis 256–257
History, see Specimen history
Holding devices 58–59
Hooded crane, inclusion body disease of cranes in 153
Horned lark, chlorinated hydrocarbon poisoning in 297
Horse, see Livestock
House finch
avian pox in 169
mycoplasmosis in 115–119
salmonellosis in 104
House finch conjunctivitis, see Mycoplasmosis
House sparrow
chlorinated hydrocarbon poisoning in 297
eastern equine encephalomyelitis in 171
salmonellosis in 104, 107
Housing, of confined wildlife 54–55, 63
Huddling together 105
Human health risks
of aflatoxin 269
of algal toxins 266
of aspergillosis 133
of avian botulism 280
of avian cholera 91–92
of avian influenza 184
of avian pox 169
of bacterial diseases 74
of candidiasis 136
of chlamydiosis 113–114
of chlorinated hydrocarbons 302
of cyanide 345
of eastern equine encephalomyelitis 174
of eustrongylidiosis 227
of fusariotoxin 270

of lead 333–334
of mercury 340
of Newcastle disease 179
of oil pollution 314
of pesticides 293
of polychlorinated biphenyls 307
of salmonellosis 100, 109
of selenium 336
of staphylococcosis 123–124
of tuberculosis 98
Hungarian partridge
histomoniasis in 157
lead poisoning in 320
Newcastle disease in 175
transport of live animals 66
Hydrocyanic acid poisoning, see Cyanide poisoning
Hydrogen sulfide poisoning 353
Hydropericardium 185
Hypothermia 309–310, 312, 350
Hypovolemic shock 249

I

Ibis
chlamydiosis in 112
eustrongylidiosis in 225
Ice-related problems 365–367
Inactivity 208
Incineration of carcasses 21, 28–31
above-ground methods for 21, 29–30
in-trench methods for 21, 29
layering of carcasses for 32
Incinerator, portable 21, 28
Inclusion body, intranuclear 160
Inclusion body disease of cranes 140, 153–156
Inclusion body disease of falcons, see Herpesvirus disease
Incoordination 105, 172, 265, 290, 298, 300, 305–306, 339–340
Indian blue peafowl, mycoplasmosis in 118
Indirect life cycle 188–191
Infectious laryngotracheitis 158
Infectious sinusitis, see Mycoplasmosis
Influenza, avian, see Avian influenza
Inhalant anesthetics, euthanasia with 50
Insecticide poisoning 295–302
Intermediate host 188
Intestinal coccidiosis 207–213
Intestine
fibrous-to-caseous core of necrotic debris in 252–253
hemorrhage in 154, 249–251, 268, 291, 293
lesions of enteritis 122–123
light-colored areas in 211
necrosis of 157
necrotic, crumbly cores in 106–107
nodules in 95
raised tunnels on 223, 225, 227
reddened 291, 312
thick, yellowish fluid in 88
white nodules on 242
Isazophos 285
Isoflurane 50
Iso-neosolaniol 269
Isospora, see Intestinal coccidiosis

J

Jackdaw
candidiasis in 135
salmonellosis in 100
tracheal worms in 229
Japanese quail, polychlorinated biphenyl poisoning in 305
Java finch, chlamydiosis in 112
Jay
avian cholera in 79
pesticide poisoning in 288
Jugular vein, blood collection from live animals 57

K

Kanechlors® 305
Keel, prominent 217
Kesterson Reservoir 335
Kestrel
chlorinated hydrocarbon poisoning in 298
herpesvirus disease in 159
tuberculosis in 93
Kidney
congested 300
enlarged 217, 305
Kill trap 56
Kingfisher, intestinal coccidiosis in 210
King parrot, chlamydiosis in 112
Kite, candidiasis in 135
Kittiwake, avian influenza in 183

L

Lameness 95, 195, 208, 220
Landfill 101, 107, 303, 349–350
Laryngotracheitis, infectious 158
Lasso 285
Laughing gull, lead poisoning in 320
Laysan albatross
avian pox in 164–165, 167–169
lead poisoning in 317, 320–321
Laysan duck, nematodes in 255–256
Lead poisoning 285, 317–334
Leaf litter 295
Leeches, nasal, see Nasal leeches
Leech fixation procedure 248
Leg, extended to rear 265
Lesser sandhill crane, lead poisoning in 320

Lesser scaup
aflatoxin poisoning in 267
algal toxin poisoning in 264–265
intestinal coccidiosis in 207
nasal leeches in 245
trematodes in 251
Lethal injection 51
Lethargy 83, 85, 95, 118, 154, 242, 249, 267, 290, 298, 300, 305–306
Leucocytozoon, see Hemosporidiosis
Leyogonimus polyoon 252–253
Lice 258
Life cycle
of acanthocephalans 241–242
of coccidia 207–209, 215–216
direct 188–190
of Echinuria uncinata 255
of Eustrongylides 223–224
of gizzard worms 235–236
of hemosporidia 193–194
of Histomonas meleagridis 256
indirect 188–191
of Sarcocystis 219–220
of Sarconema 233–234
of tracheal worms 229–230
of trematodes 249–252
of Trichostrongylus tenuis 254
Light sensitivity 146
Limberneck, see Avian botulism
Lindane 297
Listlessness 122, 135, 195, 203
Little blue heron, chlamydiosis in 113
Liver
amyloid deposits in 96
bile stained 125–126
congested 123, 300
enlarged 195–196, 305
enlarged, swollen pale 268
fibrinous covering on surface of 122
gray spots within 123
hemorrhage in 265, 268, 361
large, pale grey areas of necrosis in 257
light patches on 211, 213
necrotic lesions of 150, 160
nodules in 95
paratyphoid nodules in 106
swollen 125–126, 154
white-to-yellow spots on 83, 87, 124, 154–155
yellow areas of tissue death in 123
Livestock
avian influenza virus in 184
botulism in 274
eastern equine encephalomyelitis virus in 172–173
euthanized carcasses 349–350
Mycobacterium avium in 93–94
Pasteurella multocida in 77
Salmonella in 107–108
Live trap 56–57
Living conditions, of confined wildlife 54–55, 63
Long-billed dowitcher, lead poisoning in 320
Long-eared owl, herpesvirus disease in 159
Loon
aspergillosis in 130
avian botulism in 274
avian cholera in 79
eustrongylidiosis in 225
mercury poisoning in 339
nasal leeches in 245
oil toxicosis in 311
renal coccidiosis in 216
ringworm in 137
Lorikeet, candidiasis in 135
Lory, candidiasis in 135
Louisiana pneumonitis, see Chlamydiosis
Louse fly 193–194
Lovebird, candidiasis in 135
Lung
cheesy plaques in 131–132
congested 113, 300, 344
dark red, granular 131, 133
fluid accumulation in 348
nodules in 95
purple areas of firmness in 183

M

M-44 sodium cyanide ejector 341–345
Macaw
chlamydiosis in 111
tuberculosis in 93
Maggots, carcass-maggot cycle of avian botulism 272–273, 279
Magpie
avian cholera in 79
mercury poisoning in 339
pesticide poisoning in 292
salmonellosis in 100, 103
Malaria, avian, see Hemosporidiosis
Mallard
aflatoxin poisoning in 267
aspergillosis in 129, 131
avian botulism in 281
avian cholera in 85
avian influenza in 181, 183
avian pox in 163–164
chlorinated hydrocarbon poisoning in 296–297, 299
duck hepatitis in 361–362
duck plague in 141, 143–144, 146, 151

lead poisoning in 317, 321, 324, 328, 330
mercury poisoning in 340
mycoplasmosis in 117
nasal leeches in 247
necrotic enteritis in 122
Newcastle disease in 175, 177, 179
pesticide poisoning in 287, 292
polychlorinated biphenyl poisoning in 303, 305
sarcocystis in 220
selenium poisoning in 335
staphylococcosis in 123
trematodes in 249
Malnutrition 367
Manchurian crane, inclusion body disease of cranes in 153
Mange 258
Man-made structures, collisions with 365–366
Manure, contaminated 97, 107
Maps 19, 23
Marbled godwit, lead poisoning in 320
Marek's disease 158, 364
Marine birds
aspergillosis in 130
avian influenza in 181, 183
avian pox in 163, 166, 169
eastern equine encephalomyelitis in 171
herpesvirus disease in 158
oil toxicosis in 311
renal coccidiosis in 216
tick paralysis in 258
Marking, see Wildlife marking
Martin, avian cholera in 79
Measurement, units of, conversion table 385–386
Medial-metatarsal vein, blood collection from live animals 57
Medical procedures, wildlife 65–67
major procedures 67
minor procedures 67
Meningoencephalitis 131, 183
Mercury poisoning 337–340
Merganser
eustrongylidiosis in 225
lead poisoning in 318
mercury poisoning in 338
nasal leeches in 245
oil toxicosis in 311
sarcocystis in 221
Metals 285
Methamidiphos 292
Methiocarb 285, 287, 292, 351
Methoxyflurane 50
Mexacarbate 287
Microcystin 263
Microsporum gallinae 137
Minimata disease, see Mercury poisoning
Mink
botulism in 274
Mycobacterium avium in 93
polychlorinated biphenyl poisoning in 303
Minnows, Eustrongylides in 223–224
Mirex 297
Mite 258
Mollusc(s), as trematode hosts 249
Molluscicides 285
Moniliasis, see Candidiasis
Monocrotophos 289, 292, 352
Mosquito 163–165, 171–174, 193–195
Motor vehicle
disinfection of 33, 38
transport of live animals in 64–65
Mottle duck, sarcocystis in 220
Mourning dove
avian pox in 164, 169
lead poisoning in 320, 333–334
salmonellosis in 103
trichomoniasis in 201, 203–205
Mouth
hard, cheesy lesions of 205
inflammation of 205
inflammation and ulceration of 269–270
lesions of 205
moist, necrotic lesions of 165
mucous discharge from 83
Murre
avian influenza in 183
oil toxicosis in 311
Muscle
cyst-like bodies in 195, 197
necrosis of 364
rice-grain cysts in 220–221
wasting of 95
Muscovy duck
algal toxin poisoning in 265
duck plague in 141, 151
inclusion body disease of cranes in 153–154
Museum collections 56–57
Mute swan
avian pox in 163–164, 169
heartworm of swans and geese in 234
lead poisoning in 318, 321
salmonellosis in 103
staphylococcosis in 123
trematodes in 249
Mycobacteriosis, see Tuberculosis
Mycobacterium avium, see Tuberculosis
Mycoplasma gallisepticum, see Mycoplasmosis
Mycoplasma meleagridis, see Mycoplasmosis
Mycoplasma synovia, see Mycoplasmosis
Mycoplasmosis 74, 115–119

Mycosis, see Fungal disease
Mycotic pneumonia, see Aspergillosis
Mycotoxicosis 128
Mycotoxins 137, 260–261, 267–270
Myiasis 258
Mynah, chlamydiosis in 111
Myocarditis 185
Myopathy, capture, see Capture myopathy

N

Nares, bleeding from 290
Nasal discharge 265
  thick, mucous-like, roppy 83
Nasal leeches 188, 245–248
National Response Center 313
National Wildlife Health Center, shipment of specimens to 14–16
ND, see Newcastle disease
Neck
  abnormal position of 319
  fluid beneath skin of 269–270
  paralysis of muscles of 277–278
  twisting of 157, 177–179
Necropsy kit 8
Necrotic enteritis 74, 122
Nematocidices 285
Nematodes 189, 254–256
  eustrongylidiosis 223–228
  gizzard worms 235–239
  tracheal worms 229–231
Nene goose, tuberculosis in 93
Neosaxitoxin 264
Neosolaniol 269
Nervous system disorder 122
Nesting, on power poles 357–360
Neurologic symptoms 172–173, 265, 269, 290
Newcastle disease 140, 175–179
  asymptomatic lentogenic 176
  lentogenic 175–176
  mesogenic 176
  neurotrophic velogenic 175–176
  velogenic 175
  viscerotrophic velogenic 176
New duck disease 122
Nictitating membrane
  paralysis of 277
  stringy, cheeselike material beneath 247
Nitrapyrin 285
Nitrous oxide 50
Nodularin 263
Northern cardinal, salmonellosis in 104
Northern fulmar, algal toxin poisoning in 264
Northern harrier
  avian cholera in 78
  lead poisoning in 320
Northern mockingbird, salmonellosis in 104
Northern pintail
  avian cholera in 85
  lead poisoning in 317, 325
  nasal leeches in 245
  sarcocystis in 220
Northern shoveler
  erysipelas in 121
  nasal leeches in 245
  sarcocystis in 220, 222
No-see-ums 194–195
Nuthatch, avian cholera in 79
Nutritional disease 356, 367
Nutritional needs, of confined wildlife 63–64
NVND, see Newcastle disease

O

Observation of wildlife, guidelines for field research 56–58
OCs, see Chlorinated hydrocarbon poisoning
Ocular discharge 265
Oil Pollution Act (1990) 313–314
Oil spill 130, 164, 283, 309–315
Oil toxicosis 285, 309–315
Okadaic acid 264
Oldsquaw
  avian cholera in 81
  oil toxicosis in 311
Oligochaetes, Eustrongylides in 223–225
Opisthotonos 361
Opportunistic infection 128, 137
Oral discharge 265
Organochlorines, see Chlorinated hydrocarbon poisoning
Organophosphorus pesticides 4, 287–293, 352
Oriole, avian cholera in 79
Ornithosis, see Chlamydiosis
Osmoregulatory dysfunction 309–310
Osprey
  chlorinated hydrocarbon poisoning in 298
  mercury poisoning in 338
Osteoporosis 185
Ostrich
  avian influenza in 181
  eastern equine encephalomyelitis in 171
  intestinal coccidiosis in 210
  salmonellosis in 100
Over-straining disease, see Capture myopathy
Owl
  avian cholera in 79
  chemical poisoning in 353
  chlorinated hydrocarbon poisoning in 301, 352
  electrocution of 357
  herpesvirus disease in 157–159
  intestinal coccidiosis in 210

lead poisoning in 319
mercury poisoning in 338–339
organophosphate poisoning in 352
pesticide poisoning in 288
renal coccidiosis in 216
salmonellosis in 100, 103
trichomoniasis in 203
tuberculosis in 94
Owl herpesvirus, see Herpesvirus disease
Oxamyl 292

P

Pacific loon, algal toxin poisoning in 264
Parakeet
candidiasis in 135
chlamydiosis in 111, 113
erysipelas in 121
gizzard worms in 235
Paralysis 157, 172, 177, 179, 220, 265, 269, 277, 290
Paralytic shellfish poisoning 261, 263–264
Paramyxovirus-1, see Newcastle disease
Parasitic disease 188–189
Paratenic host 188, 192
Parathion 289, 292, 352
Paratyphoid, see Salmonellosis
Parrot
candidiasis in 135
chlamydiosis in 111–113
erysipelas in 121
intestinal coccidiosis in 210
mycoplasmosis in 115
salmonellosis in 100
tuberculosis in 93
Parrot disease, see Chlamydiosis
Parrot-fever, see Chlamydiosis
Partridge
candidiasis in 135
gizzard worms in 235
histomoniasis in 257
lead poisoning in 317
mercury poisoning in 339
mycoplasmosis in 115–116
salmonellosis in 100, 103
tuberculosis in 94
ulcerative enteritis in 123
Passerines
chlorinated hydrocarbon poisoning in 296
mercury poisoning in 339
pesticide poisoning in 287–288
Pasteurella anatipestifer, see New duck disease
Pasteurella multocida, see Avian cholera
Pasteurellosis, avian, see Avian cholera
PCBs, see Polychlorinated biphenyls
Peafowl
candidiasis in 135
erysipelas in 121
herpesvirus disease in 157
mycoplasmosis in 115, 117
salmonellosis in 100
Peanuts
aflatoxin in 267
fusariotoxin in 269–270
Pectoral sandpiper, lead poisoning in 320
Pelican
avian cholera in 79
chemical poisoning in 353
chlorinated hydrocarbon poisoning in 298
erysipelas in 121
eustrongylidiosis in 225
gizzard worms in 237
intestinal coccidiosis in 210
mercury poisoning in 338
oil toxicosis in 311
sarcocystis in 221
Penguin
aspergillosis in 130
avian cholera in 79
erysipelas in 121
hemosporidiosis in 195
oil toxicosis in 311
salmonellosis in 103–104
Penis, prolapsed 146–147
Pentobarbital poisoning, see Barbiturate poisoning
Peregrine falcon
avian pox in 165
capture myopathy in 364
chlorinated hydrocarbon poisoning in 296, 301
herpesvirus disease in 159–160
lead poisoning in 320
mercury poisoning in 339
mycoplasmosis in 115
Pericarditis 113, 125, 185
Perihepatitis 125
Peritonitis 225, 227
verminous, see Eustrongylidiosis
Permethrin 285
Pesticides 4, 284–285, 287–293, 351
Petrel, tick paralysis in 258
Petroleum, see Oil toxicosis
Pfiesteria, in fish 265
Pfiesteria toxin 264
Pheasant
avian botulism in 274–275
avian cholera in 79
avian influenza in 181, 183
candidiasis in 135
chlorinated hydrocarbon poisoning in 297, 299, 301
duck hepatitis in 361

eastern equine encephalomyelitis in 171–173
erysipelas in 121
gizzard worms in 235
herpesvirus disease in 157–158
histomoniasis in 257
intestinal coccidiosis in 210
lead poisoning in 317, 319, 332
mercury poisoning in 339–340
mycoplasmosis in 115, 117–118
Newcastle disease in 175
new duck disease in 122
salmonellosis in 100, 103
salt poisoning in 347
tracheal worms in 229, 231
trichomoniasis in 203
tuberculosis in 93–94, 96
tularemia in 124
ulcerative enteritis in 123
Phenoclors® 305
Phenol 285
Phorate 287, 289, 292, 352
Phosmet 285
Phosphamidon 292
Photographic record 3–4, 8
Phycotoxins, see Algal toxins
Physical euthanasia 49–50
Physical restraint 58–59
Pigeon
avian cholera in 79
candidiasis in 135
chlamydiosis in 111–112
chlorinated hydrocarbon poisoning in 301
eastern equine encephalomyelitis in 171
erysipelas in 121
gizzard worms in 236
hemosporidiosis in 194
herpesvirus disease in 157–159
intestinal coccidiosis in 210
lead poisoning in 332
mercury poisoning in 339
mycoplasmosis in 115–116
nematodes in 255
Newcastle disease in 176
salmonellosis in 103, 107
trichomoniasis in 201–203, 205–206
tuberculosis in 94
ulcerative enteritis in 123
Pigeon herpes encephalomyelitis virus, see Herpesvirus disease
Pigs, see Livestock
Piloerection 290
Pine sisken, salmonellosis in 104
Pinnipeds, Pasteurella multocida in 77
Pintail
avian botulism in 281
duck plague in 141
lead poisoning in 326
Piscicides 285
Pitfall, as live trap 57
Plague, fowl, see Avian influenza
Plant toxins 261
Plasmodium, see Hemosporidiosis
Plastic debris 361–363
Plover, oil toxicosis in 311
Plumbism, see Lead poisoning
Pneumonia
brooder, see Aspergillosis
mycotic, see Aspergillosis
Pneumonitis, Louisiana, see Chlamydiosis
Pododermatitis, see Bumblefoot
Poison Control Centers 371
Poisonous organism 260
Polychlorinated biphenyls 284, 303–307
Population movement, documentation of 5
Posture, aberrant 299
Potassium bromide 285
Pouch scratching 265
Poultry
avian botulism in 274
avian cholera in 77–78, 80, 82, 89
avian influenza in 183–184
candidiasis in 135
erysipelas in 121
fusariotoxin poisoning in 269
herpesvirus disease in 158
intestinal coccidiosis in 210
mycoplasmosis in 115, 117–118
nematodes in 254
Newcastle disease in 175–179
salmonellosis in 99–100, 103–105, 107, 109
subcutaneous mycosis in 137
tracheal worms in 229
trichomoniasis in 203, 206
tuberculosis in 94
tumor in 364
Poultry slaughterhouse 114
Power lines 280, 357–360
Power poles 357–360
Pox, avian, see Avian pox
Prairie falcon
herpesvirus disease in 159
lead poisoning in 320
Problem area
closure of 33–34
description of location of 5–6
Propane exploder 32, 34
Protective clothing 7, 21, 24
disinfection of 33, 38

Protein imbalance 367
Protozoan parasites 189, 256–257
Proventriculus
cheesy, raised plaques along 146, 150
impaction of 320, 328–329
nematodes in 255–256
raised tunnels on 223, 225
Prussic acid poisoning, see Cyanide poisoning
Pseudotuberculosis, see Aspergillosis
Psittacine herpesvirus, see Herpesvirus disease
Psittacosis, see Chlamydiosis
Ptarmigan, tularemia in 124
Puddle ducks
avian cholera in 81
gizzard worms in 237
lead poisoning in 318, 332
nasal leeches in 245
sarcocystis in 221
Puffin
avian influenza in 183
oil toxicosis in 311
renal coccidiosis in 216
Pullorum disease, see Salmonellosis
Punkies 194
Pupils, contraction of 290
Purple finch, salmonellosis in 104
Pyralenes® 305

Q

Quail
avian cholera in 80
avian influenza in 181
avian pox in 164
candidiasis in 135
chemical poisoning in 353
chlorinated hydrocarbon poisoning in 296
gizzard worms in 235
herpesvirus disease in 158
intestinal coccidiosis in 210
lead poisoning in 319
mercury poisoning in 338
mycoplasmosis in 115
nematodes in 255
salmonellosis in 100, 103
trichomoniasis in 203
tuberculosis in 93–94
ulcerative enteritis in 122–123
Quail disease, see Ulcerative enteritis

R

Rabbit
Mycobacterium avium in 93
Pasteurella multocida in 77
Raccoon, Pasteurella multocida in 78
Rail
avian cholera in 79
intestinal coccidiosis in 210
lead poisoning in 319
Raptors
aspergillosis in 130
avian botulism in 274
avian cholera in 80, 89
avian influenza in 181
avian pox in 163, 166
chlamydiosis in 112
chlorinated hydrocarbon poisoning in 295, 298
eastern equine encephalomyelitis in 171
electrocution of 357
gizzard worms in 237
herpesvirus disease in 158–159
lead poisoning in 317, 319, 332
mercury poisoning in 338–339
mycoplasmosis in 119
pesticide poisoning in 287–288, 291
sarcocystis in 221
traumatic injuries in 365
trichomoniasis in 202–203
tuberculosis in 94, 97
tularemia in 124
Ratites, avian influenza in 181
Raven
aspergillosis in 130
erysipelas in 121
Razorbill, salmonellosis in 103
Red blood cells, in hemosporidiosis 198–199
Red-breasted merganser
eustrongylidiosis in 226
lead poisoning in 321
mercury poisoning in 338
Red-crowned crane, inclusion body disease of cranes in 154
Red grouse, nematodes in 255
Redhead
avian cholera in 81
avian pox in 164
duck plague in 141
lead poisoning in 317, 321
nasal leeches in 245–246
staphylococcosis in 123
Red-headed falcon, herpesvirus disease in 159
Red-tailed hawk
avian pox in 165
lead poisoning in 320
mercury poisoning in 340
staphylococcosis in 123
Red-tailed tropicbird, avian pox in 164–165
Red-throated loon, mercury poisoning in 338
Red tide 261, 265

Red tide toxins, see Algal toxins
Red-winged blackbird
  pesticide poisoning in 287
  polychlorinated biphenyl poisoning in 305
Regurgitation of food 223
Rehabilitation, of oiled birds 314–315
Renal coccidiosis 215–216
Rendering of carcasses 21, 32
Reovirus, woodcock 140, 185–186
Repellents 353
Reproductive impairment 290, 309–310, 335
Reptiles
  Eustrongylides in 223–224
  Salmonella in 99
Research, see Field research
Respiratory distress 118, 131, 157, 183, 229
Respiratory syndromes 125, 185
Respiratory tract, moist, necrotic lesions of 165
Restraint 58–60
  for blood and tissue collection from live animals 57
  chemical 58, 61
  physical 58–59
Rhea, avian influenza in 181
Rice breast disease, see Sarcocystis
Rictin poisoning 356
Righting reflex, loss of 265
Ring-billed gull
  chlamydiosis in 113
  Newcastle disease in 175
  staphylococcosis in 123
Ring-dove
  polychlorinated biphenyl poisoning in 303
  salmonellosis in 100
Ringed turtle dove, herpesvirus disease in 159
Ring-necked duck, nasal leeches in 245
Ring-necked pheasant
  eastern equine encephalomyelitis in 172
  lead poisoning in 320
  mercury poisoning in 338
  mycoplasmosis in 118
  pesticide poisoning in 287
  polychlorinated biphenyl poisoning in 305
  tracheal worms in 231
Ringworm 137
Road kill 365
Road salt 347–348
Robin
  chlorinated hydrocarbon poisoning in 296
  gizzard worms in 235
  salmonellosis in 104
  ulcerative enteritis in 123
Rock dove
  lead poisoning in 323
  salmonellosis in 100
  salt poisoning in 347
Rocket net 33, 35
Rodent(s)
  eastern equine encephalomyelitis virus in 172
  Pasteurella multocida in 77–78
  Salmonella in 99, 107, 109
Rodenticides 285, 353
Rook
  salmonellosis in 100, 103
  tracheal worms in 229
Rosella, candidiasis in 135
Ross' goose, lead poisoning in 318
Rotenone 285
Rough-legged hawk
  avian pox in 165
  lead poisoning in 320
Roundworm, see Nematodes
Royal tern, lead poisoning in 320–321
Ruddy duck, nasal leeches in 245
Ruddy turnstone, avian influenza in 183
Ruffed grouse
  avian pox in 169
  gizzard worms in 235–236
  tularemia in 124
  tumor in 365
Rufous-sided towhee, salmonellosis in 104

S

Sage grouse, tularemia in 124
Saker falcon, mycoplasmosis in 117–118
Salmonellosis 74, 99–109
Salt encrustation 347–348
Salt gland 347
  disruption of 300
  impaired functioning of 310
  swollen 312–313
Salt poisoning 284, 347–348, 353
Sandfly 193
Sandhill crane
  aflatoxin poisoning in 267
  chlorinated hydrocarbon poisoning in 297
  fusariotoxin poisoning in 269–270
  inclusion body disease of cranes in 153–154
  intestinal coccidiosis in 207–208
  lead poisoning in 321
  tracheal worms in 229
  tumor in 365
Sandpiper, oil toxicosis in 311
Sarcocystis 188, 219–222
Sarcocystis rileyi, see Sarcocystis
Sarcocystosis, see Sarcocystis
Sarconema, see Heartworm of swans and geese
Sarcosporidiosis, see Sarcocystis
Sarus crane, inclusion body disease of cranes in 153

Saxitoxin, see also Paralytic shellfish poisoning 264–265
Scaled quail, lead poisoning in 320, 333
Scare devices 32, 34
Scaup
aspergillosis in 130
lead poisoning in 317
oil toxicosis in 311
Scavenger species
avian cholera in 78, 89
barbiturate poisoning in 349–350
cyanide poisoning in 342
lead poisoning in 332
Pasteurella multocida in 75
tuberculosis in 94
tularemia in 124
Scientific names of wildlife 377–381
Scoliosis 355, 367
Scoter
avian cholera in 81
avian pox in 163
oil toxicosis in 311
Seabirds
mercury poisoning in 338–339
oil toxicosis in 311
Sea ducks
avian cholera in 82
gizzard worms in 237
lead poisoning in 318
nasal leeches in 245
oil toxicosis in 311
sarcocystis in 221
tuberculosis in 96
Seasonality
of acanthocephaliasis 242
of aflatoxin poisoning 267–269
of aspergillosis 130
of avian botulism 271, 276
of avian cholera 82
of avian influenza 183
of avian pox 164–166
of barbiturate poisoning 349
of chlamydiosis 112
of chlorinated hydrocarbon poisoning 295–298
of cyanide poisoning 342
of duck plague 144–145
of eastern equine encephalomyelitis 172
of electrocutions 358
of eustrongylidiosis 223
of fusariotoxin poisoning 269
of heartworm of swans and geese 234
of hemosporidiosis 195
of herpesvirus disease 157
of intestinal coccidiosis 208
of lead poisoning 318
of mercury poisoning 339
of mycoplasmosis 118
of nasal leeches 245–246
of Newcastle disease 177
of oil toxicosis 311
of pesticide poisoning 290
of renal coccidiosis 217
of salmonellosis 104–105
of salt poisoning 347
of sarcocystis 220
of tracheal worms 229
of tuberculosis 94–95
of woodcock reovirus disease 185
Sedation 58, 349
Seed-eating birds, pesticide poisoning in 288
Seed treatment 295, 337, 339
Seizures, see Convulsions
Selenium poisoning 284–285, 335–336, 353, 367
Selenosis, see Selenium poisoning
Serovars, Salmonella 99
Sewage effluent 107
Sewage lagoon 101
Sewage sludge 99
Sewage treatment plant 108
Sewage wastewater 107
Shag
algal toxin poisoning in 264
Newcastle disease in 177
Sharp-tailed grouse
chlorinated hydrocarbon poisoning in 297, 301
tularemia in 124
Shearwater
mercury poisoning in 338
renal coccidiosis in 216
Sheep, see Livestock
Shipment of live animals 64–66
Shipment of specimen 13–17
basic supplies for 13, 373–374
blood tubes 14–15
by commercial carrier 17
containers for 13–16
cooling and refrigeration 14–16
federal regulations for 17
labeling requirements for 17
to National Wildlife Health Center 14–16
preventing breakage and leakage 13
Shivering 105
Shorebirds
aspergillosis in 130
avian botulism in 274
avian cholera in 79–80
avian influenza in 181, 183–184
avian pox in 163
candidiasis in 135

chemical poisoning in 353
chlamydiosis in 111–112
eastern equine encephalomyelitis in 171–172
gizzard worms in 237
intestinal coccidiosis in 210
lead poisoning in 319, 332
necrotic enteritis in 122
organophosphate poisoning in 352
pesticide poisoning in 288
sarcocystis in 221
Short-eared owl, avian cholera in 78
Shoveler
avian botulism in 281
chlorinated hydrocarbon poisoning in 296
lead poisoning in 318
mycoplasmosis in 117
Shrike, tularemia in 124
Silver mining 341–345
Sinusitis, infectious, see Mycoplasmosis
SI units, conversion table 385–386
Six-pack ring 363
Skin
burn marks on 359–360
nodular tubercular lesions on 95–96
wart-like nodules on featherless areas 165, 167
Skua
avian cholera in 79
salmonellosis in 104
Skull, fluid accumulation in 335
Skunk 219
Sleepaway® 51
Slug, tracheal worm carriage 229–230
Slurry runoff 99
Snails
tracheal worm carriage 229–230
as trematode hosts 249–250, 252
Snake, acanthocephalans in 242
Sneezing 231, 245
Snow goose
aflatoxin poisoning in 267
avian cholera in 75, 77, 79, 81, 91
chlamydiosis in 114
chlorinated hydrocarbon poisoning in 296
gizzard worms in 236, 239
heartworm of swans and geese in 234
lead poisoning in 317–318, 324, 328
necrotic enteritis in 122
new duck disease in 122
Snowy egret
chlamydiosis in 112, 114
eustrongylidiosis in 226–227
lead poisoning in 320
Snowy owl, herpesvirus disease in 159
Sodium pentobarbital poisoning, see Barbiturate poisoning
Songbirds
algal toxin poisoning in 264
aspergillosis in 130
avian botulism in 274–275
avian cholera in 80
avian influenza in 181
avian pox in 163, 166, 169
candidiasis in 135
carbamate poisoning in 351
chemical poisoning in 353
chlamydiosis in 111–112
chlorinated hydrocarbon poisoning in 298, 352
eastern equine encephalomyelitis in 171–173
erysipelas in 121
herpesvirus disease in 158
intestinal coccidiosis in 210
mycoplasmosis in 115–116
organophosphate poisoning in 352
rodenticide and repellent poisoning in 353
salmonellosis in 103–107
tick paralysis in 257
tracheal worms in 229
trichomoniasis in 203
tuberculosis in 94
Sooty shearwater, algal toxin poisoning in 264
Sora rail, lead poisoning in 320
Sour crop, see Candidiasis
Sparrow
avian cholera in 79–80
candidiasis in 135
salmonellosis in 100, 107
tuberculosis in 93
Sparrowhawk, mercury poisoning in 339
Specimen
choice of 7–9
collection of 7–12
basic supplies and equipment for 8, 373–374
killed specimens for catalogued collections/museums 56–58
dissection of bird 10–11
labeling of 8, 12
preservation of 7–12, 373–374
shipment of, see Shipment of specimen
Specimen history 3–6
Specimen history form 369
Spectacled eider, lead poisoning in 317
Sphaeridiotrema globulus 249, 251–252
Spleen
amyloid deposits in 96
atrophy of 305–306
congested 123
necrotic lesions of 160
nodules in 95
swollen 154

yellow-white spots on 154–155
Splenomegaly 112–113, 172, 195–196
Spoonbill, eustrongylidiosis in 225
Spore, Clostridium botulinum 271
Squeeze chute 59
Staggering 105
Stanley crane, inclusion body disease of cranes in 153
Staphylococcosis 123–124
bumblefoot 123
septicemic 123–124
Starlicide® 285
Starling
avian cholera in 79–80
candidiasis in 135
chlorinated hydrocarbon poisoning in 296
erysipelas in 121
mercury poisoning in 340
salmonellosis in 103
tracheal worms in 229
tuberculosis in 93
Starvation 309
Station brochures 19
Stellar's jay, aspergillosis in 130
Sternum, light-colored granulomas of 211–212
Stilt, avian cholera in 79
Stomach worm, see Gizzard worms
Stork
erysipelas in 121
herpesvirus disease in 158–159
Strychnine 351
Stunning and exsanguination 50
Styrofoam coolers, for shipment of specimens 13–15
Subcutaneous fat, loss of 319–320, 326
Suffocation 205
Surf scoter, nasal leeches in 245
Surgical procedures, wildlife 65–67
Swallow
chemical poisoning in 353
pesticide poisoning in 288
Swallowing difficulty 205, 223
Swan
acanthocephaliasis in 242
avian cholera in 79
duck plague in 141, 151
erysipelas in 121
gizzard worms in 236–237
heartworm of swans and geese in 233–234
hemosporidiosis in 194
lead poisoning in 317–318, 333
nasal leeches in 245, 248
oil toxicosis in 311
renal coccidiosis in 216
salmonellosis in 100, 103
sarcocystis in 221
tracheal worms in 229
trematodes in 249
Swift, avian cholera in 79
Swim-in trap 33
Swimming, circular 83, 85, 148
Syngamiasis, see Tracheal worms
Syngamus trachea, see Tracheal worms
Systox® 285

T

T-2 toxicosis, see Fusariotoxin poisoning
Tailings ponds 342
Tail vein, blood collection from live animals 59
Talon (claw), vegetation clenched in 290–291
Talon® (pesticide) 285
Tapeworms, see Cestodes
Tarsal vein, blood collection from live animals 59
TB, see Tuberculosis
Teal
lead poisoning in 318
nasal leeches in 245
sarcocystis in 220
Tears, excessive 290
Temephos 287
Temik 285
Tenosynovitis 185
Terbufos 285, 292, 352
Tern
avian cholera in 91
carbamate poisoning in 351
chemical poisoning in 353
chlamydiosis in 111–112
erysipelas in 121
gizzard worms in 237
mercury poisoning in 338
salmonellosis in 99–100, 103–104
sarcocystis in 221
tularemia in 124
Theromyzon, see Nasal leeches
Thiram 285
Thirst 146, 290
Thorny-headed worms, see Acanthocephaliasis
Thrasher, avian cholera in 79
Throat, inflammation of 205
Thrush (bird)
avian cholera in 79
pesticide poisoning in 288
Thrush (disease), see Candidiasis
Thymus gland
atrophy of 185
hemorrhage in 154
Tick 69, 124, 257–258
Tick paralysis 257–258
Tissue sample

collection of 7–9
collection from live animals 57–58
containers for 8–9
fixation of 8
labeling of 12
Toes, clenched 177, 265
Tongue, ulcerative “cold sore” under 146–148
Toxaphene 296–297
Toxic gas, euthanasia with 50–51
Tracheal worms 229–231
Tranquilizer gun 58
Transformers 357–360
Transmission lines 357–360
Transport host 188, 192
Transport myopathy, see Capture myopathy
Transport of live animals 64–65
confinement during shipping 65–66
Trapping of wildlife 33, 35
Traumatic injury 290, 356, 365–366
Tree sparrow, salmonellosis in 104
Trematodes 189, 249–253
Tremors 105, 172, 177, 208, 265, 267, 290, 298, 300, 305–306, 339
Trichomonas gallinae, see Trichomoniasis
Trichomoniasis 188–189, 201–206
Trichophyton gallinae, see Ringworm
Trichostrongylidosis 254–255
Trichostrongylus tenuis, see Trichostrongylidosis
Trichothecene 260, 269
Trichothecene mycotoxicosis, see Fusariotoxin poisoning
Triumph® 285
Trumpeter swan
acanthocephaliasis in 242
avian pox in 163–164
heartworm of swans and geese in 234
lead poisoning in 321
nasal leeches in 245, 247
Tuberculosis 93–98
Tularemia 124
Tumbling 107
Tumors 356, 364–365
herpesvirus-related 157
Tundra swan
aspergillosis in 130
avian pox in 163–164
heartworm of swans and geese in 234
lead poisoning in 317–318, 321, 324, 328
nasal leeches in 245
Turkey
avian cholera in 82
avian influenza in 181, 183
avian pox in 165
candidiasis in 135
chlamydiosis in 111
erysipelas in 121
hemosporidiosis in 197–198
herpesvirus disease in 158
histomoniasis in 257
intestinal coccidiosis in 210
lead poisoning in 319
mercury poisoning in 339
mycoplasmosis in 115–116
nematodes in 255
Newcastle disease in 176
new duck disease in 122
salmonellosis in 99–100
ticks on 257
tracheal worms in 229
trichomoniasis in 203
tuberculosis in 93–94
wild, see Wild turkey
Turkey vulture
lead poisoning in 320
mercury poisoning in 339
Turtles, Salmonella in 99
Typhoid, fowl, see Salmonellosis

U

Ulcerative enteritis 74, 122–123
Upland gamebirds
aspergillosis in 130
avian botulism in 274
avian cholera in 80
avian influenza in 181, 183
avian pox in 163, 166, 169
chlamydiosis in 111–112
eastern equine encephalomyelitis in 171–172
lead poisoning in 319, 333
mycoplasmosis in 115, 119
pesticide poisoning in 288
ulcerative enteritis in 123
Uric acid salts 217, 348

V

Venipuncture 57–58
Venomous organism 260
Vent
bloodstained 249
bloody discharge from 146
bright green staining of 327
pasted 105
Ventricular nematodiasis, see Gizzard worms
Ventriculus, raised tunnels on 223, 225
Verminous peritonitis, see Eustrongylidiosis
Viral disease 140
Visceral gout 172–173
Vision, impaired 118
Vitamin deficiency 367

Voice changes 172
Vomiting 265, 269, 290
Vomitoxicosis, see Fusariotoxin poisoning
Vomitoxin 269
Vulture
avian botulism in 274
avian cholera in 78
pesticide poisoning in 288
tuberculosis in 94
VVND, see Newcastle disease

W

Wading birds
avian cholera in 79–80
avian pox in 163
eustrongylidiosis in 223, 225, 227
gizzard worms in 237
mercury poisoning in 338
necrotic enteritis in 122
oil toxicosis in 311
pesticide poisoning in 288
sarcocystis in 220–221
Walk-in trap 33
Warfarin 285
Wariness, loss of 146
Warty nodules, on featherless areas 165, 167
Wastewater discharge 97, 101, 107, 225, 280, 309, 335
Wastewater pits, oil-field 312
Wastewater sites 94
Watercraft
for carcass collection 21, 26
disinfection of 33
transport of live animals in 64–65
Water deprivation, see Salt poisoning
Water drawdown 279
Waterfowl
aspergillosis in 130
avian botulism in 274–275
avian cholera in 75, 78, 80, 91
avian influenza in 181, 183–184
avian pox in 163, 169
capture myopathy in 364
carbamate poisoning in 351
chemical poisoning in 353
chlamydiosis in 111–112
chlorinated hydrocarbon poisoning in 296, 298, 301
eastern equine encephalomyelitis in 171–172
fusariotoxin poisoning in 269
gizzard worms in 235
hemosporidiosis in 194
herpesvirus disease in 158–159
intestinal coccidiosis in 208
lead poisoning in 317, 321–322, 332
mycoplasmosis in 116
nasal leeches in 245
necrotic enteritis in 122
new duck disease in 122
organophosphate poisoning in 352
pesticide poisoning in 287–288, 293, 351
renal coccidiosis in 216
rodenticide and repellent poisoning in 353
sarcocystis in 220
tracheal worms in 229
trematodes in 249
trichomoniasis in 203
tuberculosis in 94
Water quality 4
Waxwing, avian cholera in 79
Weakness 112, 195, 220, 237, 269, 290, 339
Weather 356, 365–367
Weaver, herpesvirus disease in 159
Weight loss 112, 118, 195, 203, 208, 231, 250, 257, 268, 290, 306
Wenyonella, see Intestinal coccidiosis
Western duck sickness, see Avian botulism
Western grebe, chlorinated hydrocarbon poisoning in 296
Western sandpiper, lead poisoning in 320
Wet pox 165, 168–169
Whirl-Pak bags 8–9
Whistling duck, lead poisoning in 318
White-faced ibis, chlorinated hydrocarbon poisoning in 299
White-fronted goose
avian cholera in 80
heartworm of swans and geese in 234
necrotic enteritis in 122
White ibis, lead poisoning in 320–321
White-naped crane, inclusion body disease of cranes in 153
White Pekin duck
algal toxin poisoning in 265
duck plague in 141, 143–144, 151
eastern equine encephalomyelitis in 171
inclusion body disease of cranes in 153–154
trematodes in 250
White pelican
entangled in fishing line 362
lead poisoning in 320–321
mercury poisoning in 338
Newcastle disease in 175
polychlorinated biphenyl poisoning in 303
White-tailed eagle, mercury poisoning in 339
White-tailed tropicbird, avian pox in 169
White-winged dove, chlamydiosis in 114
White-winged scoter, nasal leeches in 245
Whooper swan, lead poisoning in 321
Whooping crane
avian cholera in 91
capture myopathy in 60

eastern equine encephalomyelitis in 171–173
intestinal coccidiosis in 207
traumatic injuries in 366
tuberculosis in 97
Wildlife, in field research 53–71
Wildlife disease programs 370
Wildlife marking 44, 61–63
Wildlife Society, guidelines for use of wildlife in field research 53–71
Wild turkey
avian pox in 164–165
capture myopathy in 364
gizzard worms in 235
hemosporidiosis in 194
herpesvirus disease in 159
histomoniasis in 257
lead poisoning in 320
mycoplasmosis in 115
tracheal worms in 229
Wing(s)
flapping of 267
roof-shaped 319, 324
violent beating of 300
Wing droop 105, 131, 177–179, 257, 269, 319, 321, 324
Woodcock
lead poisoning in 319
renal coccidiosis in 216
woodcock reovirus in 185–186
Woodcock reovirus 140, 185–186
Wood duck
aspergillosis in 131
avian pox in 164
duck plague in 141
lead poisoning in 318, 321
Woodpecker
avian cholera in 79
intestinal coccidiosis in 210
Wood pigeon
candidiasis in 135
erysipelas in 121
salmonellosis in 100
tuberculosis in 95
Written history 3

Y

Yellowleg, avian cholera in 79
Yellow-naped Amazon parrot, mycoplasmosis in 115
Young birds, disease in 361

Z

Zearalenone 269
Zearalenone toxicosis, see Fusariotoxin poisoning
Zectran® 285
Zinc 285
Ziram 285
Zooplankton bloom 255–256

REPORT DOCUMENTATION PAGE

Form Approved

OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other asses of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.

1. AGENCY USE ONLY (Leave Blank)

2. REPORT DATE
1999

3. REPORT TYPE AND DATES COVERED
Final.

4. TITLE AND SUBTITLE
Field Manual of Wildlife Diseases,
General Field Procedures and Diseases of Birds

5. FUNDING NUMBERS
99/00-3204-40A40

6. AUTHOR(S)
Milton Friend and J. Christian Franson, Technical Editors

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
U.S. Geological Survey, Biological Resources Division,
National Wildlife Health Center, 6006 Schroeder Rd.,
Madison, WI 53711

8. PERFORMING ORGANIZATION REPORT NUMBER
ITR 1999-001

9. SPONSORING/MONITORING AGENCY NAMES(S) AND ADDRESS(ES)
U.S. Geological Survey, 12201 Sunrise Valley Dr.,
Reston, VA 20192

10. SPONSORING/MONITORING AGENCY REPORT NUMBER
ITR 1999-001

11. SUPPLEMENTARY NOTES
Supersedes U.S. Fish and Wildlife Service Resource Publication 167 (1987).

12a. DISTRIBUTION/AVAILABILITY STATEMENT

12b. DISTRIBUTION CODE

13. ABSTRACT (Maximum 200 words).

The "Field Manual of Wildlife Diseases, General Field Procedures and Diseases of Birds" presents practical, current information and insights about wild bird illnesses and the procedures to follow when ill birds are found or epidemics occur. Section 1 of the Manual provides information about general field procedures. Sections 2 through 5 describe various bird diseases. Sections 6 and 7 provide information about toxins that affect birds, and Section 8 describes miscellaneous diseases and hazards that affect birds. Manual lists institutions and laboratories that offer diagnostic services; sources of supplies for collecting, preserving, and shipping specimens; and it contains color illustrations for dissection.

14. SUBJECT TERMS
Bird diseases; wildlife diseases; bacterial diseases; fungal diseases; viral diseases; parasitic diseases; biotoxins; chemical toxins; general field procedures.

15. NUMBER OF PAGES
440

16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT
Unclassified

18. SECURITY CLASSIFICATION OF THIS PAGE

19. SECURITY CLASSIFICATION OF ABSTRACT

20. LIMITATION OF ABSTRACT

MSN 7540-01-280-5500

STANDARD FORM 298 (Rev. 2-89)
Prescribed by ANSI Std 439-18
298-102