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**THE CANADA GOOSE (*BRANTA CANADENSIS*)—
AN ANNOTATED BIBLIOGRAPHY**

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FISH AND WILDLIFE SERVICE

Special Scientific Report—Wildlife No. 231

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The Canada Goose (*Branta canadensis*)—An Annotated Bibliography

Compiled by

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Abstract

This bibliography contains 646 citations that deal entirely or in part with the Canada goose (*Branta canadensis*). All aspects of Canada goose biology, research, management, and taxonomy are included. The literature search was carried through 1977. Citations are listed alphabetically by author and summarized by subject matter. Most citations are annotated.

This bibliography was produced as an aid in surveying Canada goose literature, to serve anyone—administrator, manager, researcher, or layman—who has an interest in Canada geese.

I emphasize that this bibliography is in no way complete. Many general ornithological texts, bird lists, and agency reports that mentioned Canada geese only incidentally, were arbitrarily omitted. Some valuable work has probably been missed.

Citations used were obtained from the library of the Department of Wildlife Ecology, University of Wisconsin, Madison; the library of the U.S. Fish and Wildlife Service, Region III, Twin Cities, Minnesota; the Fish and Wildlife Reference Service, Denver Public Library, Denver, Colorado; computer searches of Dissertation Abstracts, Agricola, and Biosis data bases from the Steenbock Memorial Library, University of Wisconsin, Madison; *Wildlife Review*, and my files. I included all citations up through 1977; none were excluded by reason of age. A few historical citations are listed, but in general this literature is too diffuse and scattered to be included in the present effort.

Wherever possible, citations were located and verified. I assume responsibility for all errors in citation, content, or interpretation, regardless of the source.

Annotations are included as an aid in determining the relevancy of a citation to the needs of the user. The annotations were derived from four sources. First, when the original author's abstract or summary was available and of suitable length, it was reproduced as the best possible annotation. Second, lengthy original summaries were abstracted. Third, the annotations available in *Wildlife Review* were used directly. Fourth, when none of the previous conditions were met, I annotated the publication. Because of the different sources, there is great variation in the style and extent of the annotations. An "A" printed following the annotation denotes the original author as the sole or major contributor, and "WR" denotes *Wildlife Review*. If the original document was not obtained, it is marked [ONS]—original not seen. In some annotations I have inserted place names or other useful information in brackets. A subject index follows the bibliographic material.

State, Provincial, and Federal agencies are excellent sources of unpublished reports. Some of these are included when they were contained in computer searches or library collections. The user might find contacts with individual agencies fruitful.

I extend sincere thanks to D. H. Rusch for advice and guidance. I am also grateful to M. L. Burwitz, C. C. Craven, S. A. Dudley, K. L. Lyster, P. S. Mytton, and R. J. Sandler for assistance in literature reviews, and to the Service's National Wildlife Health Laboratory and Office of Cooperative Research Units for secretarial support and publication funds, respectively.

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²The Wisconsin Cooperative Wildlife Research Unit is jointly supported by the University of Wisconsin—Madison, Wisconsin Department of Natural Resources, U.S. Fish and Wildlife Service, and Wildlife Management Institute.

Bibliography

1. Adams, L. W. 1976. Radioactivity levels in Ohio's resident Canada goose (*Branta canadensis*) populations. *Ohio J. Sci.* 76(4):221-223.

Gross beta and ^{137}Cs radioactivity levels were determined for pectoralis muscle of resident Canada geese (*Branta canadensis*) from 3 wildlife areas in Ohio. The mean ^{137}Cs level was 0.9 dpm/g dry wt muscle (0.4 pCi/g), and the mean gross beta level was 20.4 dpm/g dry wt muscle (9.2 pCi/g). No differences in gross muscle radioactivity levels were observed among three wildlife areas. Bird age apparently did not affect radioactivity level. Variance components between and within birds were computed and a sampling design, to optimize allocation of resources for future sampling schemes, was determined. A
2. Addy, C. E. 1966. The honker—game bird of the future? Part 1. *Wildl. N.C.* 30(7):17-19.

“If we manage migration and wintering habitats properly and keep the kill within certain limits we can have many more geese in the [Atlantic] Flyway than we have today.” WR
3. Addy, C. E. 1966. The honker—game bird of the future? Part 2. *Wildl. N.C.* 30(8):10-11.

“If we want to develop and maintain strong goose flights and make it possible for hunters throughout the Flyway to hunt and harvest a share of the birds, the only sensible solution is to set state or regional kill quotas in addition to having delayed opening dates and other general regulations. . . . Very likely some sort of compulsory tagging system could be devised whereby only so many permits would be issued per state.” WR
4. Addy, C. E., and J. D. Heyland. 1968. Canada goose management in Eastern Canada and the Atlantic Flyway. Pages 10-23 in R. L. Hine and C. Schoenfeld, eds. *Canada Goose Management*. Dembar Educational Research Services, Madison, Wis. 195 pp.

An overview of Canada goose populations and management in the Atlantic Flyway. Taxonomic classification; population units; breeding, migration, and wintering habitat; and magnitude and location of hunting mortality are discussed. Management recommendations include expanded research programs, management by population unit, and expanded distribution of wintering flocks.
5. Adler, F. E. W. 1944. Chemical analyses of organs from lead-poisoned Canada geese. *J. Wildl. Manage.* 8(1):83-85.

Four lead-poisoned Canada geese were found on the shore of Swan Lake, near Portage, Wisconsin, in April 1940. Two were dead; the others were unable to fly. All lesions typical of lead poisoning were observed upon postmortem examination. Two captive geese were used as controls. For each of the six specimens the number of shot, amount of lead (weight), concentration of lead, and comparative weights of organs are discussed.
6. Aldrich, J. W. 1946. Speciation in the white-cheeked goose. *Wilson Bull.* 58(2):94-103.

Revisionary discussion of Canada-type geese, dividing them into two species, *hutchinsi* and *canadensis*, and describing a new subspecies of each. WR
7. Aldrich, J. W., and others. 1949. Migration of some North American waterfowl. U.S. Dep. Inter., Spec. Sci. Rep.—Wildl. 1. 49 pp.
8. Allen, W. R. 1968. Development and management of the Blythe Ferry Goose Management Area, Meigs County, Tennessee. *Proc. Annu. Conf. Southeast. Assoc. Game Fish Comm.* 21:155-160.

Summary of managed goose hunting on the 525-acre Blythe Ferry area adjacent to Hiwassee Refuge, Tennessee. Regulations and harvest characteristics are discussed.
9. Anderson, M. E. 1955. Trends in goose kill and species composition on private hunting areas in 1953. South Dakota Department of Game, Fish and Parks. P-R Rep. Proj. W-17-R-8. 9 pp.

Covers species composition, chronological distribution, hunter success, and crippling loss figures for the goose kill on private land along the Missouri River and Sand Lake Refuge in South Dakota for 1953.
10. Anonymous. 1948. The migrant wings turn north. *Wyo. Wildl.* 12(1-2):4-11, 34-36.

This article reports on the increase of Canada geese in the vicinity of Hawk Springs Reservoir, southeastern Wyoming, since 1940. WR

11. Anonymous. 1952. Canada geese benefit winter wheat. Virginia Commission Game Inland Fish, Educational Bull. 84:1-2.

Grazing of winter wheat by geese at Hog Island Waterfowl Refuge did the wheat little harm and provided considerable fertilization.

12. Anonymous. 1953. Do wild geese injure wheat crops? Washington Dep. Game, Washington State Game Bull. 5(3):12.

Reviews Virginia results and adds new Washington data showing that best wheat crops were obtained where geese had grazed young wheat the most closely. WR

13. Anonymous. 1958. The restoration of breeding Canada goose populations on national wildlife refuges. U.S. Fish Wildl. Serv., Wildl. Manage. Ser. Leaflet. 15. 21 pp.

The most detailed and comprehensive account of how to handle Canada geese to build up new breeding or wintering populations. It takes up: reasons for past successes and failures, prerequisites for undertaking goose restoration on a refuge, planning and construction of enclosures, age of birds to start with and how to get them, care and handling of birds, management of flock in accord with goose behavior, feeding, predator control, and how to make and apply trails. The program should begin with young of the year; adult -- seldom will breed anywhere other than their accustomed breeding sites. WR

14. Anonymous. 1962. Plattsmouth refuge offers rest stop and gives boost to gander gunning on Missouri. Outdoor Nebr. 40(11):22-23. [ONS]

15. Anonymous. 1965. California wildlife information sheet—Canada goose. Outdoor Calif. 29(2):11-12. [ONS]

16. Anonymous. 1966. Too many geese in too few places. U.S. Dep. Inter. Bur. Sport Fish. Wildl., Inter. Dep. Rep. [ONS]

17. Anonymous. 1967. Blackflies kill geese at Seney. Mich. Out-of-Doors 18(5):11. [ONS]

18. Anonymous. 1967. Great society for geese . . . it causes a big flap. Mich. Out-of-Doors 18(8):17. [ONS]

19. Anonymous. 1967. Naturalist's nook Canada geese. Wyo. Wildl. 10:15. [ONS]

20. Anonymous. 1967. The great goose chase. Natl. Wildl. 5(2):14-15. [ONS]

21. Anonymous. 1968. A Minnesota guide—to raising and releasing Canada geese. Minnesota Conservation Department, Division Game Fish. 11 pp.

This publication provides guidelines to reduce problems and lead to the establishment of successful private goose flocks under favorable conditions throughout Minnesota. Included are sections on the ecology of Canada geese, establishing a free-flying flock, nesting by the flock, hunting, permits, and miscellaneous considerations. Procedures for developing and caring for a flock of Canada geese are detailed.

22. Anonymous. 1968. The Canada goose. Canadian Wildlife Service. 6 pp.

A general brochure describing the races, ranges, migration, nesting areas, and general behavior of Canada geese. Brief mention of Canadian Wildlife Service migratory waterfowl management is included.

23. Anonymous. 1969. Goose project started on Illinois mined lands. Outdoor News Bull. 23(10):4. [ONS]

24. Arthur, G. 1958. Illinois builds a goose flock. Naturalist 9(1):43-45.

General discussion of the management involved in the building of the Canada goose flocks in the Horseshoe Lake area of southern Illinois.

25. Arthur, G. C. 1968. Farming for Canada geese. Pages 113-115 in R. L. Hine and C. Schoenfeld, eds. Canada goose management. Dembar Educational Research Services. Madison, Wis. 195 pp.

History, economics, and techniques used in raising food for Canada geese in southern Illinois are discussed.

26. Arthur, G. C., and D. D. Kennedy. 1972. A permanent site waterfowl trap. J. Wildl. Manage. 36(4):1257-1261.

Design and use of a 50- x 100-foot waterfowl trap with a concrete foundation is presented. Since 1966, three such traps have been used to

trap and band more than 83,000 ducks and geese. A

27. Ashley, H. W. 1966. Where has the wild goose gone? *Fla. Wildl.* 19(12):18-21. [ONS]
28. Atkeson, T. Z., and L. S. Givens. 1954. The use of livestock pastures in southeastern waterfowl management. *J. Wildl. Manage.* 18(3):407-408.
- Discussion of the role of pastureland in providing winter food for waterfowl, especially all species of geese. Vegetative species of importance, care of the pasture, and physical characteristics of the land are covered.
29. Atwater, M. G. 1959. A study of renesting in Canada geese in Montana. *J. Wildl. Manage.* 23(1):91-97.
- Renesting Canada geese were studied on 12 reservoirs in Phillips County, Montana, during 1956 and 1957. Twelve females were live-trapped at their nests during the egg-laying or incubation stage. Eggs were removed from these nests to simulate natural nest destruction. Two of the marked females renested; one renested twice, the other once. Each took 2 to 2.5 weeks to renest the first time. One started a third nest within a week after the second nest had been terminated during incubation. Characteristics and locations of the re-nests are discussed.
30. Atwood, E. L. 1948. Goose management at Kentucky Woodlands National Wildlife Refuge. *Ky. Warbler* 24(2):23-27.
- This refuge was established in 1938 between the lower Tennessee and Cumberland rivers. Ducks responded quickly to the shallow impoundments that covered 300 acres by 1941. Goose use began in 1940 with a decoy flock of 8 crippled Canadas and has grown more slowly. Since 1940 increasingly large acreages of winter small grains and legumes have been planted, the decoy flock has been increased, and more and more geese have wintered. On February 28, 1948, there were on the refuge 475 Canada geese. WR
31. Bagley, G. E., L. N. Locke, and G. T. Nightingale. 1967. Lead poisoning in Canadian geese in Delaware. *Avian Dis.* 11(4):601-608.
- "Delaware state waterfowl biologists have estimated that perhaps as many as 2,000-4,000 Canada geese succumbed to what appears to be lead poisoning during the winter of 1965-66. Such losses suggest that lead poisoning among Canada geese is probably of greater importance than the literature would indicate." WR
32. Bailey, A. M. 1949. Hybrid of snow and Canada goose. *Auk* 66(2):197.
- A crippled male lesser snow goose, *Chen hyperborea hyperborea*, kept with a pinioned flock of Canada geese, *Branta canadensis*, on a game farm in Denver, Colorado, successfully mated with a female Canada. Two offspring were produced. A description of these two young is included with a photograph.
33. Bailey, A. M., and R. J. Niedrach. 1938. Notes on Colorado geese. *Auk* 55(3):519-520.
- A listing of the species and subspecies of geese found in Colorado as residents or migrants, including a description of specimens found in Colorado collections.
34. Baker, C. M. A., and H. C. Hanson. 1966. Molecular genetics of avian proteins—VI. Evolutionary implications of blood proteins of eleven species of geese. *Comp. Biochem. Physiol.* 17:997-1006. [ONS]
35. Balham, R. W. 1954. The behavior of the Canada goose (*Branta canadensis*) in Manitoba. Ph.D. Thesis. Univ. Missouri, Columbia. 244 pp.
- A modern technical behavior study that covers such topics as break-up and reconstitution of flocks, pairing of yearlings, time of mating, incubation behavior, nature and defense of territory, functions of aggressive activity, cause and results of social displays, displacement activities, infrequency of re-nesting, dominance hierarchy, leadership, flock integration, and synchronization of molt. WR
36. Balham, R. W., and W. H. Elder. 1953. Colored leg bands for waterfowl. *J. Wildl. Manage.* 17(4):446-449.
- Instructions for the construction and use of colored Plexiglas (plastic) leg bands for waterfowl are presented.
37. Ballou, R. M. 1954. Nesting, distribution, and mortality studies of Canada geese on the Green River. Pages 68-82 in Wyoming Game Fish Commission. P-R Rep. Proj. W-50-R-3. [ONS]
38. Ballou, R. M. 1955. Wyoming honkers decrease. *Wyo. Wildl.* 19(8):4-5.

39. Ballou, R. M. 1956. Nesting, distribution, and mortality studies of Canada geese. Wyoming Game Fish Commission. 31 pp. [ONS]

40. Ballou, R. M. 1957. A brief review of Wyoming's goose restoration program. Proc. Annu. Conf. West. Assoc. Game Fish Comm. 37:251-255.

A progress report on releases of Canada geese at eight sites in Wyoming in an attempt to establish resident breeding flocks. Considerations for acquiring restoration stock, age at release, and site selection are discussed.

41. Ballou, R. M. 1957. Nesting, distribution, and mortality studies of Canada geese. Wyoming Game Fish Comm. 36 pp. [ONS]

42. Ballou, R. M., and F. W. Martin. 1964. Rigid plastic collars for marking geese. J. Wildl. Manage. 28(4):846-847.

Rigid plastic collars of one to three colors proved useful for recognition of individual Canada geese (*Branta canadensis*). The collars did not seem to affect the behavior of the geese, and there was little mortality caused by their use. In good light, bright colors are visible through a 20-power spotting scope for more than 1 mile. Retention of collars was about 90 percent for 1 year and more than 80 percent for 2 years. A

43. Ballou, R. M., and G. F. Wrakestraw. 1954. More geese for Wyoming. Wyo. Wildl. 18(10):4-7, 35.

A review of the first year and a half of Wyoming's program to restore resident Canada goose populations is presented. A brood flock to provide goslings for restoration stockings was set up to supplement stockings of transplanted full-winged geese. In all cases of plantings, goslings proved to be better suited because they remained at the planting sites while yearling birds and adults tended to disperse. Movements of planted birds as determined by neckband observations, mortality, and breeding success are traced for each of the restoration sites.

44. Barnston, G. 1862. Recollections of the swans and geese of Hudson's Bay. Zoologist 20:7831-7837. [ONS]

45. Barraclough, M. E. 1954. Biology of Canada geese (*Branta canadensis moffitti*) in the flat-head valley of Montana. M. S. Thesis. Montana State Univ., Bozeman. 91 pp.

Size of breeding population (about 1/2 of total population), nesting biology, nesting success (73% in 1953, 51% in 1954), causes of failures (weather, disturbance by man, crows), re-nesting (by about 30% of unsuccessful pairs), clutch size (2-10, av. 5-6), relationship of clutch size to various factors, hatching success (about 5 in successful nests, av. of 3.5 over-all in 1953 and 2.2 in 1954), travels of young soon after hatching (2-10 miles), combined broods, gosling mortality (0-25%, depending on local conditions), movements of flocks during hunting season and their relation to hunting pressure, hunting statistics (cripple loss about 33%), composition of bags (56% juveniles), band recoveries (20.6% in first year and 33.6% for geese banded in 1 area), overwintering in area (winter losses seemed low), status of population (level or increasing a bit), management recommendations for area. WR

46. Barry, T. W. 1967. Geese of the Anderson River Delta, Northwest Territories. Ph.D. Thesis. Univ. Alberta, Edmonton. 212 pp. [ONS]

47. Batt, B. D. J., J. A. Cooper, and G. W. Cornwell. 1975. The occurrence of twin waterfowl embryos. Condor 77(2):214.

One twin Canada goose embryo was found during a field study with records on 3,005 eggs. It is hypothesized that low temperature may be the causative agent in twinning.

48. Baylor, L. M. 1971. Banded Canada goose at Rapid City, South Dakota. Bird Notes 23(4):99. [ONS]

49. Bednarik, K. E. 1963. Canada goose management units in Ohio. Ohio Department of Natural Resources. Game Res. Ohio 2:244-260.

Captive flocks of Canada geese have been maintained on three waterfowl refuge areas in Ohio from 1957 through 1960. The history and management of these and other goose management areas in Ohio are reviewed. Gosling production and goose harvest from each area are described. A total of 1,129 goslings are known to have been produced on these three areas in the 4-year period; 465 were produced in 1960.

50. Bednarik, K. E. 1964. Geese for Ohio's hunters. Ohio Conserv. Bull. 28(11):22-24, 33. [ONS]

51. Bednarik, K. E. 1965. Canada goose management in Ohio. Ohio Department of Natural Resources. Game Res. Ohio 3:180-206.

Summarizes the annual production and harvest of the Canada goose, management problems, and projected management measures on Ohio's three Canada goose management units, 1958-63. Emphasis is on more recent years, especially 1963. In 1963, 1,050 goslings were produced at the Mercer County unit, 350 at Killdeer Plains, and 211 at Mosquito Creek; a total of 1,611. Approximately 2,035 Canada geese were harvested in the vicinity of these three management units. Data on nest success and use of nest structures are included.

52. Bednarik, K. E., J. Koerner, and J. Neff. 1970. Canada goose management investigations. Ohio Division Wildlife. 48 pp.

Work done on the wildlife refuge gives a 13-year gosling production summary, 1957-69. Discusses the effects of upland game hunting and field trials on the movements of the geese and the neutron activation analysis of feathers to determine hatching sites. A vinylite collar was tested in marking the geese. [ONS]

53. Bell, J. G. 1970. Horicon goose dilemma. Wis. Conserv. Bull. 35(6):16-17.

A brief review of the crop depredations and development of satellite goose management areas associated with a large and expanding Canada goose population at Horicon Marsh, Wisconsin.

54. Bell, J. G., L. F. Gunther, and L. R. Jahn. 1956. Horicon Marsh: The managed goose hunt—1955. Wis. Conserv. Bull. 21(4):23-25.

For the third consecutive year a managed waterfowl hunt was held on a portion of the Horicon Marsh National Wildlife Refuge. The 1955 hunting plan was similar to that of 1954. The area hunted was very nearly the same with only minor adjustments of blind locations and retrieving lines. The number of blinds remained at 114 and the spacing was slightly over 200 yards apart. There was no change in the length of the hunting strip. Success of the hunt is discussed.

55. Bell, J. G., L. R. Jahn, and L. Gunther. 1955. Horicon's managed goose hunt—1954. Wis. Conserv. Bull. 20(3):12-14.

Discussion of the kill, management changes, and hunters' opinions associated with Horicon's 1954 goose hunt.

56. Bell, R. Q., and W. D. Klimstra. 1970. Feeding activities of Canada geese in southern Illinois. Trans. Ill. Acad. Sci. 63(3):295-304.

Investigation of feeding activity of *Branta canadensis interior* during fall and winter, 1953-55. Feeding activity correlated with low light intensity. Corn, small grains, pasture, and soybeans were utilized in that order. Major foods were soybeans, corn, Johnson grass, various aquatics, and wheat.

57. Bellrose, F. C. 1976. Ducks, geese and swans of North America. Stackpole Books. Harrisburg, Pa. 543 pp.

Summary of available knowledge on Canada geese in textbook format. Headings include morphometric data, identification, population status, distribution, migration behavior, breeding, postbreeding, and food habits.

58. Belsom, D. J. 1974. History and present status of Canada geese in Louisiana. M.S. Thesis. Louisiana State Univ., Baton Rouge. 136 pp. [ONS]

59. Bennett, E. 1953. Nesting birds of the shoreline and islands of Crab Orchard Lake with particular reference to the Canada goose, *Branta canadensis* (Linnaeus) and the eastern red-wing, *Agelaius phoeniceus* (Linnaeus). M.S. Thesis, Southern Illinois Univ., Carbondale. 42 pp. [ONS]

60. Bennett, G. F., and C. D. MacInnes. 1972. Blood parasites of geese of the McConnell River, N.W.T. Can. J. Zool. 50(1):1-4.

Of 736 blue, snow, and Canada geese from the McConnell River, N.W.T. which were examined for blood parasites only 21 birds (2.9%) were found to be infected. Of these, 15 infections were with *Leucocytozoon simondi* (2.0%) and 2 each with *Parahaemoproteus nettionis*, *Plasmodium* species, and microfilaria. Both adults and young of the year were infected. We suggest that the low incidence is an indirect result of adaptations of the simuliid vectors to tundra conditions. It is possible that increased incidence of *L. simondi* in the boreal forest is a factor contributing to the restriction of five of the six North American goose species to the tundra nesting habit. A

61. Benson, D., and S. D. Browne. 1966. Canada goose populations and stocking program in New York in 1965. New York State Division of Fish and Game. 15 pp. [ONS]
62. Benson, D., and L. W. Degraff. 1961. Canada goose stocking in New York. New York State Division of Fish and Game. 13 pp. [ONS]
63. Benson, R. I. 1967. Migratory waterfowl division experimental Canada goose repopulation studies—Lac Qui Parle Wildlife Management Area, 1966. Minnesota Division of Fish and Game 27(1):8-18. [ONS]
64. Benson, R. I., and A. C. Anderson. 1968. Restoration of the Canada goose. *Naturalist* 19(3):16-21. [ONS]
65. Bent, A. C. 1925. Life histories of North American wildfowl. U.S. Natl. Mus. Bull. 130:204-236.
66. Bianchini, M. 1975. The presence of *Branta canadensis* new record in Europe. *Riv. Ital. Ornitol.* 45(1):75-76. [ONS]
67. Birkebak, R. C., E. A. LeFebvre, and D. G. Raveling. 1966. Estimated heat loss from Canada geese for varying environmental temperatures. *Minn. Mus. Nat. Hist. Tech. Rep.* 11. 25 pp.
- Estimates of heat loss at different environmental temperatures were made for two subspecies of Canada geese, *Branta canadensis parvipes* and *B. c. maxima*. Quantitative results placed the smaller *parvipes* under larger thermal stresses than the *maxima*. Implication is that winter energy balance has been important in establishing winter distribution-body size relationships. *Maxima* winters under colder winter regimes than does *parvipes*, and the subspecies *interior* is intermediate in both size and winter distribution. Detailed techniques and calculations are included.
68. Bishop, R. A. 1973. Northern nesting grounds study of EPP of Canada geese. Iowa Conservation Commission. 57 pp. [ONS]
69. Bishop, R. A., and R. G. Howing. 1972. Re-establishment of the giant Canada goose in Iowa. *Proc. Iowa Acad. Sci.* 79(1):14-16.
- Giant Canada geese (*Branta canadensis maxima*) were common nesters in Iowa before 1900 but were exterminated through over-exploitation about that time. Recent efforts by the Iowa Conservation Commission to re-establish these birds have been successful. By providing protection and nesting areas this flock has been increased from a few pairs in 1964 to 800-1,000 birds in 1970. The birds have adapted to the surrounding habitat and established a migration tradition. The goal is to increase the flock to 7,000 birds. [Reproductive data are discussed.] A
70. Blandin, W. W. 1970. Nesting success and brood survival (*Branta canadensis interior*, *canadensis*, and *maxima*). Massachusetts Division of Fish and Game. [ONS]
71. Blandin, W. W., and H. W. Heusmann. 1974. Establishment of Canada goose populations through urban gosling transplants. *Trans. Northeast Sect. Wildl. Soc. Annu. Conf.* 31:83-100.
- Released live decoy geese in the 1930's provided a source of Canada goose breeding stocks in Massachusetts. Three races, *Branta canadensis canadensis*, *B. c. interior*, and *B. c. maxima* were probably represented in the initial stocks. Expanding nonmigratory goose populations on the Sudbury Reservoir necessitated a control program. From 1967-73, 322 goslings, 5-10 weeks of age, were transplanted to selected sites in western Massachusetts. Although field observations verified successful nesting attempts at or near release sites by at least 6 of the 159 released females, establishment of breeding goose flocks was not achieved. Recovery data is discussed.
72. Blurton Jones, N.G. 1956. Census of breeding Canada geese 1953. *Bird Study* 3:153-170.
- "A B.T.O.-aided investigation of the British breeding population of *Branta canadensis*, showed that in July 1953 between 2200 and 4000 adults, non-breeders and goslings were present. The birds are distributed in isolated localized groups and there is little attempt at colonization of new waters. Man appears to be the only predator of any importance, and at least one colony has been exterminated by mass egg-collecting." WR
73. Blurton Jones, N. G. 1960. Experiments on the causation of the threat postures of Canada geese. *Wildfowl Trust Annu. Rep.* 11:46-52.
- A pair of Canada geese hand-reared in 1953 were used between 1955 and 1958 to test experimentally the hypothesis that certain dis-

play postures of this species are caused by a conflict between tendencies to attack and to flee from an opponent. Various postures are discussed.

74. Blus, L. J., and W. D. Klimstra. 1962. Some actions of Canada geese and small mammals. *Trans. Ill. Acad. Sci.* 55(3-4):191-197.

Discussion of a correlation between goose utilization of a given habitat and the occurrence of a given species of mouse.

75. Bone, T. 1973. Influence of artificial nesting structures on Canada goose production. Wyoming Fish and Game Commission. 90 pp. [ONS]

76. Bossenmaier, E. F. 1954. Nesting, distribution, and mortality studies of Canada geese on the Green River. Pages 45-67 in Wyoming Fish Game Commission, P-R Rep. Proj. W-50-R-3. [ONS]

77. Boyer, R. L., and M. J. Psujek. 1975. Canada goose parasitizing mallard nest. *Wilson Bull.* 87(2):287.

A single Canada goose egg was found in a mallard nest with a clutch of 11. The mallard eggs were believed to have hatched successfully while the goose egg was later destroyed, possibly by a raccoon.

78. Brace, R. K. 1972. A study of the nesting ecology, productivity, and mortality of Canada geese at Waterhen Marsh, Saskatchewan. M.S. Thesis. Univ. Saskatchewan, Saskatoon. 162 pp. [ONS]

79. Bradshaw, F. 1930. Unusual nesting sites. *Can. Field-Nat.* 44(6):149-150.

Record of a Canada goose nesting in a tree approximately 20 ft from the ground.

80. Bradshaw, J. E., and D. O. Trainer. 1966. Some infectious diseases of waterfowl in the Mississippi Flyway. *J. Wildl. Manage.* 30(3):570-576.

To establish the presence of selected infectious diseases in a "healthy" wild waterfowl population, a serologic and parasitologic study was initiated. Sera from 123 Canada geese (primarily *Branta canadensis interior*) and 179 mallards (*Anas platyrhynchos*) were screened for antibodies against six arboviruses. There was no neutralizing antibody detected against western viral encephalitis, eastern viral encephalitis, St. Louis viral encephalitis, Venezuelan viral encephalitis, California viral en-

cephalitis, or vesicular stomatitis. Sera from 55 ducks and 12 geese were negative for agglutinating antibodies to *Salmonella pullorum*, *Salmonella typhimurium*, and *Mycoplasma gallisepticum*. Fifty-five duck sera and 11 goose sera were negative for complement-fixing antibodies of ornithosis. The most significant serologic finding was the presence of Newcastle disease antibody. Forty (17 percent) of 236 Canada geese were positive for Newcastle disease antibody. Thirty-seven (14 percent) of 267 mallard ducks had antibody titers for Newcastle disease virus. A limited study of parasitism revealed a low prevalence of *Haemoproteus*, *Leucocytozoon*, and microfilariae in both geese and mallards as well as *Plasmodium* in wild geese. The significance of the serological and parasitological findings is discussed. A

81. Brakhage, G. K. 1964. Canada goose nesting and management studies on selected areas in Missouri. Missouri Conservation Commission. 26 pp. [ONS]

82. Brakhage, G. K. 1965. Biology and behavior of tub-nesting Canada geese. *J. Wildl. Manage.* 29(4):751-771.

Results of a 3-year study (1961-64) of a sedentary flock of Canada geese (*Branta canadensis maxima*) at Trimble Wildlife Area in Missouri. Most nesting was in elevated wash-tubs. Productivity, courtships, density of nests, territorial requirements, renesting, and behavior of young are discussed.

83. Brakhage, G. K. 1965. Canada goose nesting and management studies on selected areas in Missouri. Missouri Conservation Commission. 11 pp. [ONS]

84. Brakhage, G. K. 1966. Tub nests for Canada geese. *J. Wildl. Manage.* 30(4):851-853.

Since 1958 Canada geese in Missouri have used elevated nesting sites. Washtubs mounted on pipe have proven acceptable. Spacing, usage, length of service, and nest losses are discussed.

85. Brakhage, G. K., H. M. Reeves, and R. A. Hunt. 1971. The Canada goose tagging program in Wisconsin. *Trans. N. Am. Wildl. Nat. Resour. Conf.* 36:275-295.

Discussion of the 1967, 1968, and 1969 permit and tagging programs used in Wisconsin to control the harvest of Canada geese,

particularly in the heavy harvest area of the Horicon National Wildlife Refuge. The primary goals of controlling statewide kill, distributing the kill more equitably among the hunters, upgrading the hunting experience, and gathering valuable management data as a side benefit were all met with varying degrees of success.

86. Brazda, A. R., and G. Pospichae. 1966. Coordinated inventory of "small" Canada geese. U.S. Bureau Sport Fisheries Wildlife Report. 7 pp. [ONS]
87. Brazda, A. R., and J. W. Winship. 1962. Coordinated inventory of "small" Canada geese in the Central and Mississippi flyways. U.S. Bureau Sport Fisheries Wildlife Report. 19 pp. [ONS]
88. Brenner, F. J. 1960. Canada geese nesting on a beaver lodge. *Auk* 77(4):476.
89. Bromley, R. G. 1976. Nesting and habitat studies of the dusky Canada goose (*Branta canadensis occidentalis*) on the Copper River Delta, Alaska. M.S. Thesis. Univ. Alaska, Fairbanks. 91 pp. [ONS]
90. Brooks, A. 1914. The races of *Branta canadensis*. *Condor* 16(3):123-124.
- Early work based on "Study of a Collection of Geese" by H. S. Swarth. Revision of the range of *Branta canadensis occidentalis* and a discussion of the taxonomy of *B. c. canadensis*, *B. c. minima*, and *B. c. hutchinsii* are included.
91. Brooks, A. 1926. Notes on the geese of the *Branta canadensis* group. *Ibis* Ser. 12, 2:339-346.
- Discussion of the taxonomy of the *Branta canadensis* group regarding assignment of specific or subspecific status for *B. c. canadensis*, *B. c. hutchinsii*, and *B. c. minima*. A description of each taxonomic grouping, a review of available specimens, and morphometric data are presented.
92. Bryens, O. M. 1940. Some notes on the Canada goose. *Jack Pine Warbler* 18:81-82.
- Dates and numbers of Canada geese observed on spring and fall migrations through Michigan from 1924-39.
93. Buckalew, J. H. 1977. Distribution of Canada geese. *N. Am. Bird Bander* 2(2):58-60. [ONS]
94. Bull, J. 1970. A New Jersey specimen of *Branta canadensis parvipes*. *Proc. Linn. Soc. N.Y.* 71:155. [ONS]
95. Burton, B. 1966. Surveying the geese. *Md. Conserv.* 43(5):14-18. [ONS]
96. Buss, I. O., and L. D. Wing. 1966. Pre-impoundment observations of wintering mallards and nesting Canada geese on the Snake River, southeast Washington. *Res. Stud. Wash. State Univ.* 34(1):1-36.
- Nesting studies of Canada geese were conducted on six islands of the Snake River in southeastern Washington from 1954 through 1965, except 1962. During 11 annual surveys, 228 nests were studied. The resident goose population on the study area maintained a level of approximately 4.5 to 8.5 geese per mile of river. Variation in nesting density among islands was high, ranging from 1.5 to 31.6 acres per nest with an average of 8.4. The average percentage of the 228 nests that hatched was between 72.8 and 75.5 and annually the nests that hatched ranged from 55% to 94%. Data on clutch size, nesting density, and history of nests lead to the conclusion that scattered nests are more successful than crowded ones.
97. Butterfield, W. K., and A. H. Dardiri. 1969. Serologic and immunologic response of wild waterfowl vaccinated with attenuated duck plague virus. *Bull. Wildl. Dis. Assoc.* 5(2):99-102.
- Herring gulls, Canada geese, and mallard ducks were orally vaccinated with attenuated duck plague virus and challenge inoculated with virulent virus. Geese did not produce antibody to attenuated virus and 11 of 12 died after immunity challenge.
98. Cadwell, L. L. 1969. Behavior study of Canada geese in southeast Washington. M.S. Thesis. Washington State Univ., Pullman. [ONS]
99. Caldwell, J. R. 1963. Some records of the Canada goose breeding in southwestern Saskatchewan. *Blue Jay* 21(2):62-63.
- Covers historical records of Canada geese breeding in Saskatchewan south of the South Saskatchewan River and west of Swift Current. Includes Ducks Unlimited brood counts on selected areas made between 1958 and 1962.

100. Caldwell, J. R. 1967. Breeding ecology of the Canada goose on the south Saskatchewan River. Saskatchewan Department of Natural Resources Progress Report. [ONS]
101. Canfield, T. H. 1949. Sex determination of geese. Minn. Agric. Exp. Stn. Bull. 403. 6 pp. [ONS]
102. Cannon, D. G. 1938. Some trematode parasites of ducks and geese in eastern Canada. Can. J. Res. (Sect. C) 16(9):268-279.
*Psilochasmus longicirratu*s and *Echinostoma revolutum* are reported as parasites found in the Canada goose.
103. Chabreck, R. H., and H. H. Dupuie. 1976. Alligator predation on Canada goose nests. Copeia 2:404-405.
At the Rockefeller Wildlife Refuge in Louisiana, of 692 Canada goose nests followed over the period 1961-72, 86 (12.4%) were destroyed by predators. Alligators were positively identified as predators on 35 nests (5.1%). Much of the predation on 44 additional nests (6.4%) was probably by alligators.
104. Chamberlain, J. L. 1959. Gulf coast marsh vegetation as food of wintering waterfowl. J. Wildl. Manage. 23(1):97-102.
Eight Canada goose gizzards were examined. Plant materials made up 100% of the contents. The frequencies (percent) of food items were seeds, 63; vegetation, 75; and tubers, 25.
105. Champion, B. 1957. Green grass where the wild goose goes. Outdoor Am. 22(5):4-7.
Discusses farming practices at Kentucky Woodlands Wildlife Refuge.
106. Chapman, J. A. 1967. Population characteristics, hunter kill, and productivity of dusky Canada geese. M.S. Thesis. Oregon State Univ., Corvallis. 82 pp. [ONS]
107. Chapman, J. A. 1970. Weights and measurements of dusky Canada geese wintering in Oregon. Murrelet 51(3):34-37.
Presents measurements on the morphology of the dusky Canada goose (*Branta canadensis occidentalis*) population wintering in the Willamette Valley of Oregon during 1965-66, 1966-67.
108. Chapman, J. A., C. J. Henny, and H. M. Wight. 1969. The status, population dynamics, and harvest of the dusky Canada goose. Wildl. Monogr. 18. 48 pp.
Describes the population characteristics of the dusky Canada goose (*Branta canadensis occidentalis*) and evaluates the impact of harvest in the species principal range of southeastern Alaska, British Columbia, Washington, and the Willamette Valley in Oregon. Includes coverage of all facets of population dynamics, banding and band returns, bag checks, questionnaires, tail feather surveys, aerial surveys, migration data, nesting, distribution, survival, and life tables. Work was conducted in 1964-67.
109. Clark, B. 1969. The Lamar-eads Wildlife Area. Colo. Outdoors 18(6):8-9. [ONS]
110. Clark, E. R., and G. T. Nightingale. 1960. Canada goose management on national wildlife refuges in the Northeast. Trans. Northeast Sect. Wildl. Soc. Annu. Conf. 7 pp. (mimeo)
Discusses history of, and programs for, increasing nesting and wintering Canada goose populations on the following refuges in the northeastern United States: Brigantine, Misisquoi, Montezuma, Moosehorn, Parker River, and Troy Meadows.
111. Cockran, R. 1963. Goose factory. Ohio Conserv. Bull. 27(5):8-10. [ONS]
112. Cole, D. B. 1974. Canada geese nesting sites on islands in southern Alberta. Alberta Department of Lands and Forests, Fish and Wildlife Division. 18 pp. [ONS]
113. Collias, N. E., and L. R. Jahn. 1959. Social behavior and breeding success in Canada geese (*Branta canadensis*) confined under seminatural conditions. Auk 76(4):478-509.
The breeding behavior, vocalizations, and dominance order of Canada geese (*Branta canadensis*) confined under seminatural conditions at Horicon Marsh, Wisconsin, are described in some detail, with special reference to social interactions between individually marked birds.
Pair formation depends both on specific preferences and on dominance relations between individuals. The nest site is selected by the female of a pair; she is escorted in the search by the more aggressive male. Repeated attempts at establishment on suitable nest sites and repeated eviction by more dominant birds is the

rule for birds of relatively low dominance status.

When regular incubation begins, copulation ceases. After hatching, the goslings usually spend a day in the nest before leaving. During their first week, goslings are apt to become lost and are readily adopted into some other family. However, the early development of aggressiveness against strangers by the goslings, as well as by their parents, tends to preserve the integrity of each family.

Loss in productivity of the breeding colony was very largely due to the territorial behavior of the birds themselves resisting the crowded conditions. In the breeding season of 1952 at the Horicon Marsh colony, about 70 percent of the theoretical or potential increase was lost. In turn, this loss was traced mainly to (1) failure of birds to pair effectively, (2) failure to lay and incubate eggs, and (3) to loss of the clutch once laid, all generally as a result of domination of other birds. A

114. Collins, B. D. 1953. A nesting study of the Canada goose at Tule Lake and Lower Klamath National Wildlife Refuges. Proc. Annu. Conf. West. Assoc. Game Fish Comm. 33:172-176.

Topics include characteristics of nest sites, cover types of sites, nesting success, causes of failures, grouping of broods, and total production. Of 201 nests observed, 158 hatched, giving a nesting success of 78.6%. Desertion, the major cause of nest failure, was attributed to crowding on islands and consequent intra-specific strife. Hatching success for successful nests was 87%, with an average clutch of 5.13 eggs and average hatch of 4.43 eggs. Two percent of the eggs were infertile and about 9.5% contained dead embryos. Brood counts indicated that some broods joined with others in the first week after hatching. Total goose production at Tule Lake in 1952 was 1,845 young.

115. Cook, R. S., and D. O. Trainer. 1966. Experimental lead poisoning of Canada geese. J. Wildl. Manage. 30(1):1-8.

Canada geese (*Branta canadensis*) were experimentally exposed to known amounts of lead. The course of the lead and of the disease in geese was followed, utilizing established laboratory procedures. Gross signs of lead poisoning first appeared 5-7 days following ingestion. The length of time until signs of disease or death occurred was related to the

amount of lead ingested. Twenty-five or more pellets resulted in death within 10 days, while 10 or fewer pellets permitted survival as long as 72 days. Ingestion of large numbers of pellets resulted in a rapid increase of lead levels in the blood, acute poisoning, and early death. Ingestion of fewer pellets resulted in a slower increase of lead in the blood, chronic poisoning, and longer survival, with more "typical" lead poisoning signs and pathology. Lead pellets appeared to erode at a constant rate regardless of the number in the gizzard. The largest lead pellet volume (66 percent) was eroded within the first 3 days after exposure, and it took approximately 45 days for the remaining volume to disappear. Normal lead levels of blood for Canada geese were found to be 0.018-0.037 mg/100 g blood. The lead levels of blood of lead-poisoned geese reached a peak between the third and tenth day, and ranged from 0.320-1.680 mg/100 g. Internal lesions as well as histopathological changes are described. High lead levels in blood and liver tissue, typical signs, and pathological lesions were necessary to diagnose lead poisoning in geese. The possible significance and effect of lead poisoning on the fecundity of geese are discussed. A

116. Cooke, W. W. 1906. Distribution and migration of North American ducks, geese, and swans. U.S. Biol. Surv. Bull. 26. 90 pp.

117. Cooper, J. A. 1974. The history and nesting biology of the Canada geese at Marshy Point, Manitoba. Ph.D. Thesis. Univ. Massachusetts, Amherst. 395 pp. [ONS]

118. Cooper, J. A., and B. D. J. Batt. 1972. Criteria for aging giant Canada goose embryos. J. Wildl. Manage. 36(4):1267-1270.

Includes a developmental series presented in 3-day intervals with photographs and a description including wing, toe, and bill measurements of the embryo.

119. Cooper, J. A., and J. R. Hickin. 1972. Chronology of hatching by laying sequence in Canada geese. Wilson Bull. 84(1):90-92.

Correlation of laying, pipping, and emergence is discussed for nests examined near Clarkleigh, Manitoba, in 1971.

120. Cowan, A. B., and C. M. Herman. 1955. Winter losses of Canada geese at Pea Island, North Carolina. Proc. Annu. Conf. Southeast. Assoc. Game Fish Comm. 9:172-174.

Examines history and causes of recurrent excessive mortality in Canada geese wintering along the outer banks of North Carolina. Field work indicated that heavy infections of the gizzard worm (*Amidostomum anseris*) compounded by malnutrition was responsible.

121. Cowan, I. McT. 1954. An indication of population mixing in Canada geese. *Murrelet* 35(3):45.

Two geese banded as juveniles within range of *Branta c. moffitti* in B.C. were recovered in summers of subsequent years in Bathurst Inlet area of the N.W.T. in range ascribed by Delacour to *B. c. parvipes*. WR

122. Cowan, P. J. 1973. Parental calls and the approach behavior of young Canada geese: A laboratory study. *Can. J. Zool.* 51(6):647-650.

123. Cowan, P. J. 1974. Individual differences in alarm calls of Canada geese leading broods. *Auk* 91(1):189-191.

Alarm calls of adult Canada geese were recorded near Churchill, Manitoba, and converted to spectrograms for analysis. Intra-bird variation in calls was found to be very slight, whereas differences between birds were judged sufficient to allow individual recognition by goslings.

124. Cowan, P. J. 1974. Individual parental calls and auditory discrimination hearing by young *Gallus gallus* and *Branta canadensis*. Ph.D. Thesis. Univ. Manitoba, Winnipeg. [ONS]

125. Craighead, F. C., Jr., and J. J. Craighead. 1949. Nesting Canada geese on the upper Snake River. *J. Wildl. Manage.* 13(1):51-64.

Geese in the Jackson Hole, Wyoming, area were studied during the spring of 1947. Nesting started about 1 April, with the peak of laying and hatching between 18-23 April and 16-21 May, respectively. Nesting was completed by 1 June. Nests were distributed over a 40-mile stretch of the Snake River, averaging about 2 per mile, with marked concentrations in the wide channel-split expanses of river bottom. Ninety-five percent of the nests were located on islands and most sites were elevated piles of drift or sod situated on or beside gravel bars. The average distance of 43 nests from water was 43 feet, the maximum 150 feet, and the minimum 1 foot. The average clutch determined from 17 nests was 4.6 eggs per nest; 5 was thought to be a more representative figure. Eighty-eight pairs of geese either nesting or ex-

hibiting territorial behavior were located, and this was considered very close to the actual nesting population. One hundred six goslings were known to have reached the flying stage. Mortality and flooding losses are discussed and management suggestions are presented.

126. Craighead, J., and F. Craighead. 1957. Bright dyes reveal secrets of Canada geese. *Natl. Geogr.* 112(6):817-832.

127. Craighead, J. J., and D. S. Stockstad. 1956. A colored neckband for marking birds. *J. Wildl. Manage.* 20(3):331-332.

The use, construction, and effectiveness of a plastic neck marker used on Canada geese in Montana are described. A single- or double-tailed strip of polyvinyl chloride tape was hung from the bird's neck.

128. Craighead, J. J., and D. S. Stockstad. 1956. Measuring hunting pressure on Canada geese in the Flathead Valley. *Trans. N. Am. Wildl. Conf.* 21:210-238.

During 1953, 1954, and 1955, data were gathered on Canada goose numbers, goose movement, hunting pressure, and goose kill in the Flathead Valley of Montana in order to evaluate the dynamics of hunting pressure. Relationships among all these variables are examined. Management applications are included.

129. Craighead, J. J., and D. S. Stockstad. 1958. Goslings descend from aerial nest. *J. Wildl. Manage.* 22(2):206-207.

Observations on Canada goose goslings descending 15 feet from an artificial nesting platform to the water are presented. All three goslings made the descent unharmed. Other observations and brood counts confirmed that artificial platforms placed in trees for nesting do not present a hazard to the goslings.

130. Craighead, J. J., and D. S. Stockstad. 1961. Evaluating the use of aerial nesting platforms by Canada geese. *J. Wildl. Manage.* 25(4):363-372.

During a 5-year-period (1953-58) an average of 73 aerial platforms were available to Canada geese. The availability of aerial sites apparently caused a decrease in ground nesting. Aerial nesting, both natural and on the provided platforms, increased from 5% in 1953 to 18% in 1958. Distribution of nesting pairs and productivity of platform nesters are also discussed.

131. Craighead, J. J., and D. S. Stockstad. 1964. Breeding age of Canada geese. *J. Wildl. Manage.* 28(1):57-64.
- This study was designed to determine what percent of 1-, 2-, and 3-year-old wild geese (*Branta canadensis moffitti*) nest in a population of limited size; to compare results with similar information from captive flocks; and, by applying the breeding-age data obtained, to determine the percent of breeding geese in the Flathead Valley population. Five hundred forty-eight known-age Canada geese in the Flathead Valley population were color-marked during four breeding seasons, and the survivors were observed for breeding activity over a 5-year period. Most of the marked known-age geese were located prior to nesting; then the number of nesting birds in each age group was determined by censuses throughout the breeding seasons. A similar experiment was conducted on two captive flocks. No 1-year-old birds nested in either the wild or the captive populations. Between 27 and 36 percent of the 2-year-old wild geese nested, but only 17 percent of the captive 2-year-olds did so. All of the 3-year-old wild birds nested, but only 64 percent of the captives nested. Since the proportion of birds breeding in captive and in wild flocks appears to be markedly different, the breeding data from captive flocks cannot be used to determine the breeding age or the percent of breeding birds in a wild population. The breeding-age statistics obtained from the wild population, when applied to life-table data, showed that during a population-turn-over period of 5 years only 10.2 percent of a generation of geese in the Flathead Valley, Montana, attained breeding age and survived to nest. This calculation was made on the assumption that one-third of all 2-year-old geese nest. A
132. Crider, E. D. 1967. Canada goose interceptions in the southeastern United States, with special reference to the Florida flock. *Proc. Annu. Conf. Southeast. Assoc. Game Fish Comm.* 21:145-155.
- Relates band recoveries of Canada geese banded in Florida to the decline of geese wintering in Florida and other southeastern States. Indications are that large refuges with grain farming along the traditional migration routes have intercepted the Canada geese enroute to Florida. Problems of these interceptions are discussed.
133. Crider, E. D. 1967. Oral narcotic capture technique for Canada geese. *Florida Game Fresh Water Fish Comm.* 3 pp. [ONS]
134. Crider, E. D., and J. C. McDaniel. 1967. Alpha-chloralose used to capture Canada geese. *J. Wildl. Manage.* 31(2):258-264.
- During field trials in the winters of 1965 and 1966, 573 Canada geese (*Branta canadensis*) and 5 blue geese (*Chen caerulescens*) were caught with alpha-chloralose, an oral hypnotic administered on bait. The mortality rate was 2.6 percent of 475 geese captured with 0.25 g of the drug mixed with each cup of bait. Heavier dosages produced higher mortality rates. An effective capture technique based on alpha-chloralose is described. A
135. Crissey, W. F. 1968. Informational needs for Canada goose management programs. Pages 141-147 in R. L. Hine and C. Schoenfeld, eds. *Canada goose management*. Dembar Educational Research Services, Madison, Wis. 195 pp.
- The author feels that the Canada goose is the waterfowl species most likely to supply hunting recreation far into the future. To accomplish this end over a wide geographic area, five data collection programs are recommended: a periodic fall and winter census, a survey to measure size and distribution of the kill, a survey to measure age ratio in the kill, a pre-season banding program, and a postseason banding program. The greatest *single* informational need for management is data on the population dynamics of individual wintering concentrations.
136. Critcher, S. 1950. Renal coccidiosis in Pea Island Canada geese. *Wildl. N.C.* 14(1):14-15, 22.
- "Approximately 500 Canada geese died on the Pea Island Migratory Waterfowl Refuge during February, March and April of 1949." There was a shortage of food and extremely unsanitary conditions. All of the birds examined were less than 1 year old. Their death appeared to be due to renal coccidiosis, caused by *Eimeria truncata*. Snow geese and ducks apparently were not affected. WR
137. Crow, J. H. 1971. Earthquake initiated changes in the nesting habitat of the dusky Canada goose. Pages 130-136 in K. B. Krauskopf, chairman. *The great Alaska earthquake of 1964*. National Academy of Science, Washington, D.C. [ONS]

138. Damaske, N. 1952. Greenwood refuge: Home of honkers. *Wis. Conserv. Bull.* 17(4):3-6.
- Covers the early history of the Greenwood Refuge near Hancock, Wisconsin. Includes a description of the area, ownership, feeding patterns for both migrant and wintering geese, and utilization of the Refuge by goose hunters and goose watchers.
139. Dardiri, A. H., and P. Gailunas. 1969. Response of Pekin and mallard ducks and Canada geese to experimental infection with duck plague virus. *Bull. Wildl. Dis. Assoc.* 5(3):235-247.
- Canada geese were infected by oral inoculation or contact exposure to duck plague virus. Clinical signs and pathologic changes are discussed. The mortality rate was high in Canada geese.
140. Davis, F. H. 1954. The Horseshoe Lake flock of Canada geese and some of its management problems. U.S. Fish Wildl. Serv. 9 pp. (mimeo)
- A brief history of the development of the Horseshoe Lake, Illinois, flock and the problems associated with a large concentration of geese.
141. Davis, M. 1945. Blue \times Canada goose hybrid. *Auk* 64(4):636.
- Report of two progeny of blue-Canada cross received at the National Zoological Park in Washington in 1945.
142. Davison, D. W. 1925. Nesting of the Canada goose in a tree. *Can. Field-Nat.* 39(9):197-198.
143. Dawe, N. K., and B. D. Davies. 1975. A nesting study of Canada geese on the George C. Reifel Migratory Bird Sanctuary, British Columbia, Canada. *Syesis* 8:1-7. [ONS]
144. Dawson, W. L. 1897. Nesting of the larger white-cheeked goose (*Branta canadensis occidentalis*) in Okanogan Co., Wash. *Auk* 14(1):87-88.
- A description of a nest found in May 1896 on a shelf of rock overlooking a fast-flowing stretch of the Columbia River in Washington. Four goslings were present.
145. Day, A. M. 1946. Goose business. *Outdoorsman* 88(3):20-21, 57-58.
- History of goose concentration at Horseshoe Lake, Illinois, and the need for its management.
146. DeAngelis, D. L. 1976. Application of stochastic models to a wildlife population. *Math Biosci.* 31(3-4):227-236. [ONS]
147. Debbie, J. G. 1971. Hemagglutination-inhibition antibody titers against Newcastle disease virus in Canada geese. *N.Y. Fish Game J.* 18(1):64-65.
- Sera from juvenile, yearling, and adult Canada geese from two New York wildlife management areas were tested for hemagglutination-inhibition antibody titers against Newcastle disease virus. Positive tests varied with age class, area, and year. Test results are presented in tabular form.
148. Delacour, J. 1951. Preliminary note on the taxonomy of Canada geese, *Branta canadensis*. *Am. Mus. Novitates* 1537. 10 pp.
- "Drawing heavily on the unpublished materials of the late James Moffitt, the author proposes a taxonomic system for the white-cheeked geese recognizing a single species with 12 subspecies, two of which are previously undescribed." WR
149. Delacour, J., and E. Mayr. 1945. The family Anatidae. *Wilson Bull.* 57(1):3-55.
150. Dennis, R. H. 1964. Capture of moulting Canada geese in the Beauly Firth. *Annu. Rep. Wildfowl Trust* 15:71-74.
- Thirty-nine of a flock of 153 flightless adult Canada geese (*Branta canadensis*) were captured. Some of the captured birds had been earlier banded, and the first evidence of "moult migration" in Canada geese was thus obtained. Weights and measurements are given. WR
151. Dery, A. 1938. Migration automnale de la grande oie blanche. (Autumn movements of greater snow geese from Cap Tourmente, Quebec to New Inlet, North Carolina). Pages 120-133 in the Annual Report of the Provancher Society Natural History Canada. [ONS]
152. Desser, S. S., and A. K. Ryckman. 1976. The development and pathogenesis of *Leucocytozoon simondi* in Canada and domestic geese in Algonquin Park, Ontario. *Can. J. Zool.* 54(5):634-643.
- The development of *Leucocytozoon simondi* was studied in naturally and experimentally injected *Branta canadensis maxima*, *Branta canadensis interior*, and *Anser domesticus*. The number of mature round gametocytes in the

peripheral blood of the Canada geese increased between days 9 and 15 post exposure (PE) and decreased rapidly thereafter. Mean peak parasitemias recorded on day 13 PE were (per 1000 red blood cells (RBC)): 8 gametocytes in *B. c. maxima*, 16 gametocytes in *B. c. interior*, and 17 gametocytes in *A. domesticus*. About 3 weeks PE, gametocytes disappeared from the peripheral circulation and were not observed again during the autumn, winter, and spring in birds kept in the laboratory.

Hematocrit determinations in the Canada geese revealed a low fluctuating anemia during the primary infection which subsided by day 21 PE. A more severe anemia was recorded in *A. domesticus* with a mean low packed RBC value of 18% on day 11 PE. Immature and mature hepatic schizonts were observed in the Canada and domestic geese between 3 and 8 PE. Neither megaloschizonts nor elongate gametocytes were seen. Clinical signs, pathology, and mortality commonly associated with *L. simondi* infection in ducks were not observed. Hypotheses are advanced to explain reports of severe pathogenesis associated with *L. simondi* infections in Canada geese in other localities. A

Description of the use and construction of a projection-type net trap used to capture geese at Swan Lake National Wildlife Refuge, Missouri. Success, limitations, and operating hints are discussed.

153. Devine, T., and T. J. Peterle. 1968. Possible differentiation of natal areas of North American waterfowl by neutron activation analysis. *J. Wildl. Manage.* 32(2):274-279.

The possibility of using neutron activation analysis to differentiate sources of North American waterfowl was investigated by irradiating rectrices and wingbones of birds collected in several localities, and comparing characteristic gamma-ray spectra. Canada goose (*Branta canadensis*) rectrices from Oregon specimens could be distinguished from those taken in Wisconsin and Colorado based on higher levels of Mn.

154. Dey, N. H. 1960. Color marking and field observation of Canada geese to determine breeding territorialism, family organization, and population dynamics. Utah Wildlife Resources Div. 8 pp. [ONS]
155. Dey, N. H. 1964. Canada goose production and population stability, Ogden Bay waterfowl area, Utah. M.S. Thesis. Utah State Univ., Logan. 38 pp. [ONS]
156. Dill, H. H., and W. H. Thornsberry. 1950. A cannon-projected net trap for capturing waterfowl. *J. Wildl. Manage.* 14(2):132-137.

157. Dill, H. H., and F. B. Lee, editors. 1970. Home grown honkers. U.S. Fish Wildl. Serv. 154 pp.

Technical information for establishing small breeding flocks of giant Canada geese in home areas is presented. Details for acquiring breeding stock, pen facilities needed, food and water requirements, management of breeding pairs, incubation, and brooding and rearing of goslings are provided. Special problems such as disease are also considered. Work by federal, state and private agencies in goose restoration during the past 20 years is reported. WR

158. Dimmick, R. W. 1968. Canada geese of Jackson Hole—their ecology and management. *Wyo. Game Fish Comm. Bull.* 11. 86 pp.

Study conducted in 1961-64 to describe the flock of Great Basin Canada geese (*Branta canadensis moffitti*) in Jackson Hole with respect to its seasonal distribution, local movements, migration, natality, and mortality. A complete description of the annual cycle of this flock is included with population dynamics data and recommendations for future management.

159. Donahue, J. M., and L. D. Olson. 1969. Survey of wild ducks and geese for *Pasteurella* spp. *Bull. Wildl. Dis. Assoc.* 5(3):201-205.

Nasal pharyngeal swabs were taken from 400 waterfowl and 37 feral pigeons (*Columba livia*) and cultured for the presence of *Pasteurella multocida*, the causative agent of fowl cholera. Blood samples were also taken from these birds and tested for antibodies for *P. multocida*. *Pasteurella multocida* was not isolated from any of the birds. However, two of the waterfowl had antibodies for *P. multocida*. The nasal pharynges of 50 Canada geese (*Branta canadensis*) were also cultured for *Pasteurella anatipestifer*, the causative agent of anatipestifer infection. *Pasteurella anatipestifer* was isolated from 4 of these geese. Experimental inoculation of mallards (*Anas platyrhynchos*) demonstrated that they are susceptible to anatipestifer infection. A

160. Donaldson, D. 1968. Honkers avoiding Arkansas, but why? *Ark. Game Fish* 2(1):23-26. [ONS]

161. Donnelly, J. 1962. The Canada goose at McClintic. W. Va. Conserv. 26(4):16-19.

A brief description of the growth and development of a resident breeding flock of Canada geese at the McClintic Wildlife Station near Point Pleasant, W. Va. Includes a short life history section.

162. Douville, C. H., and C. E. Friley, Jr. 1957. Records of longevity in Canada geese. Auk 74(4):510.

Six records of longevity in Canada geese (*Branta canadensis*) were secured from banded birds killed during the 1951, 1954, and 1955 hunting seasons at Swan Creek Wildlife Experiment Station in southwestern Michigan. All six birds were banded at the Jack Miner Bird Sanctuary, Kingsville, Ontario, Canada. The birds were at least 12, 13, 15, 18, and 23 years old. Sex and weight data are included.

163. Dow, J. S. 1943. A study of nesting Canada geese in Honey Lake Valley, California. Calif. Fish Game 29(1):3-18.

Case histories were obtained for a total of 418 Canada goose nests during 1939 and 1940 at Honey Lake, California. For both years, nesting began around 1 March, reached a peak by 15 April, and ended by 10 May. In 1939, 140 nests contained 713 eggs, an average clutch of 5.09; in 1940, 215 nests contained 1099 eggs, an average of 5.10. In 1939, 52.5%, and in 1940, 60% of the nests were successful. In 1940, hatching success of 697 eggs was 93%. Nest site selection, cover preference, and nest losses are discussed. Management recommendations include predator control, particularly of coyotes, regulation of water levels, and control of fires.

164. Dresser, C. V. 1955. The goose hangs high. Am. For. 61(12):28-29, 59-60.

What the states and federal government are doing to establish new breeding colonies of Canada geese in the U.S. and how they are going about it. WR

165. Drewien, R. C. 1969. Cry of the wild gets a helping hand. S. Dak. Conserv. Digest 36(1):16-19. [ONS]

166. Drewien, R. C. 1969. Investigations into rearing and restoration of breeding Canada geese (*Branta canadensis*) in South Dakota 1967. S. D. Dep. Game Fish Parks. P-R Rep. Proj. W-75-R-10. 10 pp.

Report of project activities directed toward establishing a free-flying flock of breeding geese in South Dakota. Outlines success of previously introduced geese and plans for further releases.

167. Drewien, R. C., and R. R. Johnson. 1968. Cooperative study of the northeastern South Dakota resident Canada goose population, 1964-1967. S. D. Dep. Game Fish Parks and U.S. Bur. Sport Fish. Wildl. 28 pp.

A 4-year study of the status of a resident nesting population of reintroduced giant Canada geese. Production, success, and mortality were evaluated. Introduction of nesting platforms and banding programs were carried out. Management recommendations are included.

168. Duffy, M. 1964. What has happened to the Canada goose. La. Conserv. 16(1 & 2):2-4.

As a result of artificial feeding at refuges and of increased availability of waste corn associated with mechanical harvesting further north, the number of Canada geese wintering in La. has declined markedly in the past 15 years to 6000-8000 birds. In an effort to build up a resident population in La., 2000 birds were trapped in Mo., wing-clipped, and released on a fenced area in La. Some 350,000-400,000 blue and snow geese annually winter in La. WR

169. DuMont, P., and M. H. Swenk. 1934. A systematic analysis of the measurements of 404 Nebraska specimens of geese of the *Branta canadensis* group formerly contained in the D. H. Talbot collection. Nebr. Bird. Rev. 2:103-116. [ONS]

170. Durant, A. J. 1956. Impaction and pressure necrosis in Canada geese due to eating dry hulled soybeans. J. Wildl. Manage. 20(4):399-404.

Impaction and pressure necrosis in Canada geese due to eating dry hulled soybeans has been observed for several years at Swan Lake, Missouri. The occurrence of this malady begins about October 15 and ends about November 15 each year. It is estimated that approximately 1% of 50,000 geese are affected annually, the number of deaths depending on drought conditions occurring during the critical period. The symptoms and progression of the disease are discussed. Illustrations are included. It is recommended that on refuges where soybeans are grown by sharecroppers, the fields should

be disked or plowed immediately after harvest so that shattered soybeans will not remain available to geese.

171. Dutcher, W. 1885. The Canada goose. *Auk* 2(1):111.

Brief presentation of information on age at maturity, nesting behavior, and gosling development supplied by a New York Canada goose breeder.

172. Dzubin, A. 1965. Population dynamics and migration of Richardson's Canada goose. *Can. Wildl. Serv. Unpubl. Rep.* 1188[ONS]

173. East, B. 1950. The Canada goose can be brought back. *Outdoor Life* 105(2):38-40, 96.

The story of the development, since 1934, of the Seney National Wildlife Refuge in the Upper Peninsula of Michigan; and how, from a flock of 300 pinioned geese in 1936, the locally raised population increased to 1,860 in the fall of 1946. WR

174. East, B. 1954. The truth about Cairo. *Outdoor Life* 113(3):33-35, 118-122. [ONS]

175. East, G. 1968. A new home for honkers. *Colo. Outdoors* 17(2):16-19.

176. Elder, W. H. 1946. Age and sex criteria and weights of Canada geese. *J. Wildl. Manage.* 10(2):93-111.

The study was conducted at Horseshoe Lake, Alexander County, Illinois, and at Bright Land Farm, near Barrington, Illinois. The geese were caught in baited traps, and measurements and observations were made. Included are figures on weight, plumage, and cloacal characteristics that could be used for sex and age-class determination.

177. Elder, W. H. 1946. Implications of a goose concentration. *Trans. N. Am. Wildl. Conf.* 11:441-446.

Brief history of the development of the goose concentration at Horseshoe Lake, Illinois, in the early 1940's and the unprecedented goose kill that followed.

178. Elder, W. H. 1946. What happened to the geese at Horseshoe Lake? *Missouri Conserv.* 7(7):10-13.

Discussion of the effect of Horseshoe Lake Refuge on the migratory geese of the Mississippi Flyway with respect to heavy hunting

kills, loss of inherent wariness, and food shortage resulting from the concentration of geese.

179. Elder, W. H. 1947. Canada goose populations. *Am. Assoc. Adv. Sci. Conf.*, Paper 7. 5 pp. (mimeo)

A discussion of band returns and subsequent computed mortality for a nonmigratory population breeding in the Bear River Marshes in Utah and for 2,300 geese banded at Horseshoe Lake, Illinois, from 1940-43.

180. Elder, W. H., and N. L. Elder. 1949. Role of the family in the formation of goose flocks. *Wilson Bull.* 61(3):133-140.

Evidence is presented that a small goose flock is usually a family and that larger flocks are frequently multiples of families rather than mere aggregations of individuals. On this basis it is thought that counts of several hundred small flocks arriving in fall migration might be a good index to the success of that year's hatch. It is shown that Canada geese have a relatively constant reproduction from year to year while blue geese produce few or no young in some years. It was thought probable that a comparison of small flock sizes before and after the hunting season might give a measure of shooting pressure sustained by a particular population. WR

181. Elgas, B. 1970. Breeding populations of Tule white-fronted geese in northwestern Canada. *Wilson Bull.* 82(4):420-426.

A 1-week-old white-fronted gosling was collected which was following an adult lesser Canada goose and presumably had been adopted.

182. Elgas, B., and others. n.d. Keeping and raising wild geese in captivity. *International Wild Waterfowl Association*, Salt Lake City, Utah. 69 pp. [ONS]

183. Ellarson, R. S. 1969. Canada goose problems and control on farms. *University of Wisconsin Extension Service*, Madison. 6 pp.

An informational pamphlet for Wisconsin farmers providing a description of Canada geese in Wisconsin, potential damage problems to crops, damage control, and payments if damage occurs. Practices recommended to prevent serious goose damage are (1) harvest corn as soon as it is ripe and as quickly as possible; (2) do not open fields prior to the main harvest,

if possible; (3) protect opened fields with a low (18- to 24-inch) single-strand wire fence with brightly colored flagging or other frightening devices; (4) try to locate fields other than in the open on high land; and (5) use scaring devices such as automatic exploders and shell crackers.

184. Ellis, J. W., and J. R. Frye. 1965. Utilization of sugar beets by Canada geese. *J. Wildl. Manage.* 29(2):396-397.

In the fall of 1963, browsing Canada geese (*Branta canadensis*) on the Shiawassee Refuge in Michigan were observed for the first time feeding almost exclusively on sugar beet roots and crowns, apparently because the corn harvest was delayed and local goose browse had been made unpalatable by drought. A

185. Eneyart, G. 1963. Goose nesting project. *N. D. Outdoors* 25(10):5-7.

Fifty-eight washtub nests were placed in trees along the Garrison Reservoir in hopes of increasing goose nesting sites.

186. Evermann, B. W. 1919. Large set of eggs of the Canada goose. *Condor* 21(3):126.

187. Ewaschuk, E. 1970. The influence of territorial behavior on nesting success in a population of Canada geese. M.S. Thesis. Univ. Alberta, Edmonton. 60 pp. [ONS]

188. Ewaschuk, E., and D. A. Boag. 1972. Factors affecting hatching success of densely nesting Canada geese. *J. Wildl. Manage.* 36(4):1097-1106.

Factors affecting the hatching success of densely nesting Canada geese (*Branta canadensis*) were studied from 1967 to 1969 on a 16-acre island in Dowling Lake, Alberta. In the last year, intensive observations of behavior were included. Densities varied from 8.0 to 10.7 to 9.2 nests per acre in 1967, 1968, and 1969, respectively. Nest success varied over the same period from 60 to 27 to 69 percent. Desertion was the major factor involved in loss of clutches; predation may also have been important in 1968. Small territories, large numbers of territorial and nonterritorial geese, and high densities of nesting pairs resulted in high and constant levels of agonistic behavior throughout the nest season of 1969. Pairs that were successful in hatching all or part of their clutches always won more interactions than

they had lost with neighboring pairs and non-territorial geese. For most unsuccessful pairs, this situation was reversed. The presence of the gander in the territory was the key factor involved in the outcome of interactions. The absence of the gander led to the harassment of the goose by neighboring Ganders and eventually to desertion of the nest. Both size of territory and frequency of interaction were inversely correlated with an index of vegetation density, based on height and cover around the nest site. A

189. Fabricius, E. 1970. Kanadensiska Nybyggare. *Zool. Revy.* 32(1):19-25.

A survey of the Canada goose (*Branta canadensis*) in Sweden.

190. Fabricius, E., and T. Radesater. 1971. Aggressiva element I kacklingsceremoning ontogeni hos kandagåsen preliminär rapport. (Agonistic elements in the ontogeny of the cackling ceremony in the Canada goose—a progress report). *Zool. Revy.* 33(3-4):60-69. [ONS]

191. Fabricius, E., A. Bylin, A. Ferno, and T. Radesater. 1974. Intra- and interspecific territorialism in mixed colonies of the Canada goose (*Branta canadensis*) and the greylag goose (*Anser anser*). *Ornis. Scand.* 5(1):25-35.

The nesting of the Canada Goose and the Greylag Goose was studied in some archipelagoes in the Straits of Kalmar. Compared with the Greylag Goose, the Canada Goose nests in more open terrain, claims a larger territory, and shows a more pronounced territorialism. Most attacks were intraspecific, but the Canada Geese often attacked Greylag Geese as well, although they tolerated these at closer distances than conspecifics. In some instances Canada Geese seemed to prevent Greylag Geese from nesting within their territories, but on the whole it is possible for the Greylag Goose to breed successfully with the larger and stronger Canada Goose. Both species have shown a numerical increase in the investigated area. A

192. Fannin, J. 1894. The Canada goose and osprey laying in the same nest. *Auk* 11(4):322.

An account of a Canada goose laying in an active osprey nest in British Columbia. Of two osprey eggs and three goose eggs present, all but one goose egg were collected. The osprey incubated the remaining goose egg until it, too, was collected.

193. Farr, M. M. 1958. Three new species of coccidia from the Canada goose, *Branta canadensis*. J. Wash. Acad. Sci. 43(10):336-340. [ONS]
194. Farr, M. M., and V. G. Blankenmeyer. 1956. *Trichobilharzia brantae* n. sp. (Trematoda: schistosomatidae) from the Canada goose (*Branta canadensis* L.). J. Parasitol. 42(3):320-325. [ONS]
195. Ferguson, W. 1969. Growth rates in certain captive wild ducks. Game Bird Breeders Gaz. 18(2):12. [ONS]
196. Figgins, J. D. 1920. The status of the subspecific races of *Branta canadensis*. Auk 37(1):94-102.
197. Figgins, J. D. 1922. Additional notes on the status of the subspecific races of *Branta canadensis*. Proc. Colo. Mus. Nat. Hist. 4(3):1-18. [ONS]
198. Fjetland, C. A. 1973. Long-term retention of plastic collars on Canada geese. J. Wildl. Manage. 37(2):176-178.
Analysis of retrapped Canada geese (*Branta canadensis maxima*) at Seney National Wildlife Refuge showed that only 30 percent of the birds retained flexible plastic collars after 6 years. Retention was higher among females than among males. Fading, brittleness, and loss of the number-letter combination of the collars are discussed. A
199. Flath, D. L. 1970. Reproductive success of Canada geese in the Bitterroot Valley, Montana. M.S. Thesis. Univ. Montana, Missoula. 67 pp. [ONS]
200. Flath, D. L. 1972. Canada goose-osprey interactions. Auk 89(2):446-447.
201. Florschutz, O., Jr. 1961. Second year survey of waterfowl populations, hunting pressure, and kill at Lake Mattamuskeet, North Carolina, 1960-61. North Carolina Wildlife Resources Commission. 39 pp.
Includes periodic waterfowl inventories; determination of kill and hunting pressure, Canada goose age composition, and factors affecting kill and hunting pressure; and analysis of banding data.
202. Florschutz, O., Jr. 1962. Third year survey of waterfowl populations, hunting pressure, and kill at Lake Mattamuskeet, North Carolina, 1961-62. North Carolina Wildlife Resources Commission. 33 pp.
203. Florschutz, O., Jr. 1966. Toward better goose hunting at Lake Mattamuskeet. Wildl. N. C. 30(2):16-19.
Factors such as age ratios in the goose flock, weather, moon phases, human disturbance, and regulations are discussed as related to hunter success. Hunting pressure is then discussed, followed by a list of methods which could be used to increase kill and hunter success.
204. Florschutz, O., Jr. 1968. Canada goose populations, hunting pressure, kill, crippling loss, and age ratios at Mattamuskeet, North Carolina. Pages 53-57 in R. L. Hine and C. Schoenfeld, eds. Canada goose management. Dembar Educational Research Services, Madison, Wis. 195 pp.
Wintering populations at Lake Mattamuskeet have been declining since the early 1960's. Extensive data on hunter numbers, success, and crippling losses are presented. Average loss to hunting was 13.9% of the in-season goose population. Juvenile to adult-yearling age ratios determined from 14,000 sets of tail feathers averaged 50.7:48.1.
205. Folz, S. D., and A. C. Todd. 1967. Transfer of a plasmodium from Canada geese to domesticated geese and turkeys. Am. Microscop. Soc. 85(2):279-283. [ONS]
206. Fowler, R. M. 1972. Investigation of Missouri River Canada geese, 1970-71, South Dakota. South Dakota Department of Game Fish Parks. P-R Rep. Proj. W-75-R-13. 38 pp.
A study of the composition, by subspecies, of the Canada geese using the Missouri River during fall migration. Measurements of culmen, tarsus, and weight were made on hunter kills; the birds were then classified as small or large Canada geese. Sex and age ratios, and percentage of harvest for each of the two groups are discussed.
207. Fowler, R. M. 1973. Investigation of Canada geese, using Missouri River impoundments in South Dakota—1972-73. South Dakota Department of Game Fish Parks. P-R Rep. Proj. W-75-R-14. 21 pp.
208. Fowler, R. M. 1974. Investigation of Canada geese, using Missouri River impoundments in

- South Dakota—1973-74. South Dakota Department of Game Fish Parks. P-R Rep. Proj. W-75-R-16. 15 pp. [ONS]
209. Fowler, R. M. 1975. Investigation of Canada geese, using Missouri River impoundments in South Dakota—1974-75. South Dakota Department of Game Fish Parks. P-R Rep. Proj. W-75-R-17. 12 pp. [ONS]
210. Fried, E., and S. Browne. 1971. Fate of duck eggs laid in goose nests. *N.Y. Fish Game J.* 18(1):72.
- Five of 94 Canada goose nests located on the Wilson Hill Wildlife Management area contained one or two mallard or black duck eggs. One duckling apparently hatched and left the goose nest while the goose continued to incubate her nonviable eggs. A second egg was destroyed by a predator after the goslings hatched and left. The fate of the other three was undetermined.
211. Friley, C. E., Jr. 1959. Controlled goose shooting at Michigan's Swan Creek Highbanks. *Trans. N. Am. Wildl. Conf.* 24:245-260.
- Hunting at Michigan's publicly owned "Highbanks" is on a daily permit basis. Geese provide pass shooting as they fly from a refuge marsh to a feeding area 8 miles away. From 1953 to 1957 nearly 53,000 daily permits were issued. Hunters shot 6,618 of the large Canada geese, 22 Hutchin's geese, 13 blue geese, and 1 snow goose; hunted more than 180,000 hours; and fired nearly 450,000 shotgun shells.
212. Friley, C. E., Jr. 1960. The Canada geese of Michigan's Swan Creek Highbanks, 1953-1957. *J. Wildl. Manage.* 24(1):97-99.
- Sex and age distributions, weights, and seasonal weight variations are discussed for Canada geese of the Mississippi Valley flock utilizing the Swan Creek Highbanks in southwestern Michigan. The average weight of 6,550 geese checked was 7.97 pounds. Age-class weights, variations from year to year, and seasonal changes are included. The sex ratio in 5,540 geese was nearly even. Wide variation in the age ratios occurred through the 5 years around a mean of 87.6 immature birds per 100 adults. Extremes were 58.4 immatures per 100 adults in 1953 and 119.8 in 1957.
213. Friley, C. E., Jr. 1961. Food habits of the Canada geese in the Swan Creek Marsh. Michigan Department of Conservation. 9 pp. [ONS]
214. Fuller, R. W. 1964. Canada goose establishment and management. Vermont Fish Game Department. 7 pp. [ONS]
215. Funk, H. D. 1962. The baited cannon-net trapping technique as an indicator of Canada goose population characteristics. M.S. Thesis. Colorado State Univ., Fort Collins. [ONS]
216. Funk, H. D., and J. R. Grieb. 1965. Baited cannon-net sampling as an indicator of Canada goose population characteristics. *J. Wildl. Manage.* 29(2):253-260.
- The reliability of sex and age ratios for Canada geese (*Branta canadensis*) caught in baited cannon-net traps and the percentage of geese carrying embedded shot were investigated on wintering areas in southeastern Colorado during the winters of 1961-62 and 1962-63. A comparison of population characteristics between geese captured in baited and in unbaited traps indicated that age ratios were similar between trapping methods and periods in the Two Buttes area. Also, no difference was found between sex ratios obtained during the study, regardless of trapping method. Percentages of adult geese with shot during 1962-63, increases in percentages of young geese with shot throughout the 1962-63 hunting season, and posthunting season percentages of young geese with shot were similar between baited and unbaited samples. We concluded that, within the limits of this study, the baited technique of gathering these data is a reliable sampling procedure. A
217. Geis, M. B. 1955. Honkers' winter haunt. *Mont. Wildl.* 5(1):8-10.
- Short popular account of studies made on Canada geese in Flathead Valley, Mont., 1953-54. Courtship was underway in mid-winter and egg-laying began in March. All goslings were flying by July. About 200 pairs nested in the Valley. Also present were 400-600 geese that were 1-2 years old, too young to breed. There were 2-10 eggs per clutch, usually 5-6. About 50-75% of pairs hatched at least some young. The 200 breeding pairs produced about 800 goslings in 1953 and about 600 in 1954. Broods left nest sites within two days; many broods traveled 8-12 miles to brood rearing grounds. In 1953, about 625 goslings reached shooting age, and in 1954, about 500. Hunters killed some 365 geese in the Valley in 1953 and crippled about 120 more.

Band returns indicated that approximately 280 of these were locally reared, and that 20% of the 1,400 geese present in July were shot. Possible management measures are outlined. WR

218. Geis, M. B. 1956. Productivity of Canada geese in the Flathead Valley, Montana. *J. Wildl. Manage.* 20(4):409-419.

A study of productivity of a local population of Canada geese was conducted in 1953 and 1954 in the Flathead Valley of Montana. In 1953, there were 800 geese in the study area, 400 of which were breeding birds. In 1954, there were 1,075 geese in the area, 432 of which were breeding birds. In 1953, 225 nests were located, 25 of which were believed to be renests. In 1954, 254 nests were located and 38 of these were designated renests. Data indicated that 30-40% of unsuccessful pairs made re-nesting attempts. Over 90% of all nests were on islands; small islands supported a greater nesting density per acre than did large islands. In 1953, 73% of 199 known fate nests were successful, and in 1954, 51% of 224 such nests were successful. Taking renests into consideration, it was estimated that 82% of breeding pairs were successful in 1953, and 60% of breeding pairs were successful in 1954. Further discussion on causes of nest failure, hatching rate, and observations of color-marked broods is included.

219. Gibson, L. W., and I. O. Buss. 1972. Reactions of Canada geese to reservoir impoundment on the Snake River in Washington. *Northwest Sci.* 46(4):301-318. [ONS]

220. Glasrud, R. D. 1976. Canada geese killed during lightning storm. *Can. Field-Nat.* 90(4):503.

A six-bird family group of Canada geese was killed during a lightning storm in Saskatchewan. The birds fell from an altitude of 150-200 m. There was no external evidence of damage.

221. Glazener, W. C. 1946. Food habits of wild geese on the gulf coast of Texas. *J. Wildl. Manage.* 10(4):322-329.

Food habits of all species of geese wintering in the coastal region of Texas are examined. Canada geese are discussed individually with respect to feeding habits and behavior. Food materials from 117 geese were entirely plant materials, including 31 species of flowering plants and algae. More than 66% of the identified material was grass. Rice, corn, and grain

sorghums were the cultivated crops most commonly and extensively taken. Saltgrass, watercress, and panic grass were the native species most extensively utilized.

222. Goethe, F. 1964. Uber die Deutsche Bucht heimziehende Kanadagänse (*Branta canadensis*). (Canada geese (*Branta canadensis*) flying home over the German Bay area.) *Vogelwarte* 22(3/4):275-276. [ONS]

223. Gore, J. F. 1967. Canada goose production and history of the Comer estate in middle Tennessee. *Tennessee Game Fish Commission.* 9 pp. [ONS]

224. Gore, J. F. 1973. Forcing Canada geese into elevated nesting structures. *Proc. Annu. Conf. Southeast. Assoc. Game Fish Comm.* 27:324-328.

Canada goose nests were manually transferred from normal ground position into a metal tub. Nesting success for transferred geese was 68.5 percent. Three years average hatchability of disturbed eggs was 62.0 percent while that of undisturbed eggs was 67.5 percent. A

225. Gore, J. F., and C. J. Barstow. 1969. Status of a free flying, resident flock of Canada geese (*Branta canadensis*) in Tennessee. *Proc. Annu. Conf. Southeast. Assoc. Game Fish Comm.* 23:101-104.

226. Gould, L. L., and F. Heppner. 1974. The vee formation of Canada geese. *Auk* 91(3):494-506.

The angle between the legs of the vee formation of Canada geese and measurements of the distances between birds in formation aid in the resolution of the question of aerodynamic advantage in vee formation flights.

227. Graham, R., and F. Thorp, Jr. 1931. A laryngotracheitis syndrome in wild goose associated with pneumomycosis. *Am. Vet. Assoc. J.* 79(1):90-94. [ONS]

228. Gram, A. 1964. The fight to restore a species. *S. D. Conserv. Dig.* 31(6):22-24.

Description of the first phases of the giant Canada goose restoration project at Sand Lake National Wildlife Refuge.

229. Grau, C. R., T. Roudybush, J. Dobbs, and J. Wathen. 1977. Altered yolk structure and reduced hatchability of eggs from birds fed

single doses of petroleum oils. *Science* 195(4280):779-781.

Canada geese given 2 g of bunker C oil produced eggs with abnormal yolk rings.

230. Green, W. E., H. K. Nelson, and C. W. Lemke. 1963. Methods for determining cumulative goose kill on special areas. *U.S. Fish Wildl. Serv., Spec. Sci. Rep.—Wildl.* 72. 43 pp.

A brief history is given of the growth of the Mississippi Valley population of Canada geese. Intensive kill surveys were conducted on managed hunting areas and near areas of goose concentrations, and suggestions were offered for application of survey methods to other areas. Close correlations between results obtained in the Area Ground Survey and in the Mailed Questionnaire were found for 1960 and 1961 data. WR

231. Greenwood, R. J., and W. C. Bair. 1974. Ice on waterfowl markers. *Wildl. Soc. Bull.* 2(3):130-134.

Wild and captive giant Canada geese (*Branta canadensis maxima*) and captive mallards (*Anas platyrhynchos*) accumulated ice on neck collars and/or nasal saddles during winter storm periods in 1971 and 1972. Weather conditions associated with icing were documented, and characteristics of icing are discussed. Severe marker icing occurred during subfreezing weather when the windchill reached approximately -37°C . Birds appeared able to de-ice nasal saddles in most instances. A

232. Grice, G. D., Jr., E. L. Tyson, and E. B. Chamberlain, Jr. 1956. An unexplained mortality of Canada geese in north Florida. *J. Wildl. Manage.* 20(3):330-331.

In February 1954 112 dead geese, 10 geese active but not capable of flight, and 25 geese able to fly for short distances, were discovered in the vicinity of a 5-acre pond 12 miles north of Tallahassee. No causes of the mortality were evident; however, there was a heavy bloom of a dinoflagellate (*Peridinium volzi*) in the pond. Experimental exposure of chicks and guinea pigs to the dinoflagellate caused no ill effects. Two birds were sent to the Patuxent Research Center for examination, and fowl cholera was suggested. No unusual death of chickens or farm fowl had occurred in the area, however.

233. Grieb, J. R. 1958. The Arkansas Valley geese. *Colo. Outdoors* 7(6):10-14. [ONS]

234. Grieb, J. R. 1968. Canada goose populations of the Central Flyway—their status and future. Pages 31-41 in R. L. Hine and C. Schoenfeld, eds. *Canada goose management*. Dembar Educational Research Services, Madison, Wis. 195 pp.

Central Flyway Canada geese are subdivided into small white-cheeked and large Canada geese. The subspecies involved in this subdivision and their association by population are discussed for the Tallgrass Prairie, Shortgrass Prairie, Western Prairie, and Highline Canada goose populations.

235. Grieb, J. R. 1970. The Shortgrass Prairie Canada goose population. *Wildl. Monogr.* 22. 49 pp.

An extensive monograph on the Shortgrass Prairie Canada goose population of the Central Flyway. Included are discussions of taxonomy, range, characteristics of harvest and hunting, population status, mortality, and a population model.

236. Grieb, J. R., and G. I. Crawford. 1967. Nesting structures for Canada geese. *Colo. Game Fish Parks Dep., Game Inf. Leaflet.* 48. 4 pp. [ONS]

237. Grieb, J. R., and M. G. Sheldon. 1958. Investigation of the Arkansas Valley wintering goose flock. Pages 1-36 in *Colorado Game Fish Parks Dep., Federal Aid Quarterly Report.* [ONS]

238. Grieb, J. R., M. G. Sheldon, and D. J. Neff. 1961. Investigations of the Yampa Valley and Brown's Park nesting goose flock. Pages 7-23 in *Colorado Game Fish Parks Dep. P-R Rep. W-88-R-5.* [ONS]

239. Grieb, J. R., M. G. Sheldon, and D. J. Neff. 1961. The nesting Canada geese of Moffat County, Colorado. *Proc. Annu. Conf. West. Assoc. State Game Fish Comm.* 41:136.

A detailed study conducted during 1956-59 of "the last segment of a once widespread breeding goose population" in Colorado. Birds nesting in this area have a high production potential except in years of early flood crest of the Yampa River. Clutch and brood sizes are large compared to studies in other areas. There is a lack of conflict between this flock and agricultural and ranching activities. A management program which includes an annual census, a seasonal bag limit instead of daily bag and possession limit, and the construction of nesting structures on islands to combat the threat of floodwaters is recommended.

240. Grimm, W. C., and R. M. Sickles. 1948. The geese of Pymatuning. Pa. Game News 18(12):3, 22, 31.

A flock of Canada geese was established at the Pymatuning Reservoir in Pennsylvania with the release of 30 pinioned geese in August of 1936 and 30 more in October of 1938. Nests were first located in the spring of 1937. Wintering behavior and a migration pattern became established and the flock increased steadily to 750 birds by 1947-48.

241. Gulden, N. A., and L. L. Johnson. 1968. History, behavior and management of a flock of giant Canada geese in southeastern Minnesota. Pages 59-71 in R. L. Hine and C. Schoenfeld, eds. Canada goose management. Dembar Educational Research Services, Madison, Wis. 195 pp.

The flock of giant Canada geese wintering at Rochester, Minnesota, has been studied since 1962. The flock has increased from 250 in 1951 to 8,650 in 1966-67. Trap samples and family group counts indicate that production of young to post-hunting season age was usually between 2.0 and 2.5 per year. Band recovery analysis and fluoroscopy results are included. Concern about disease in the Rochester municipal area has been unwarranted.

242. Hall, L. 1966. Down at Possum Trot call of wild geese is summer's requiem. Def. Wildl. News 41(4):317. [ONS]
243. Hall, L. C., and F. B. McGilvrey. 1971. Nesting by a yearling Canada goose. J. Wildl. Manage. 35(4):835-836.

A free-flying Canada goose (*Branta canadensis interior*), known to be just under a year old, laid a clutch of four eggs at the Patuxent Wildlife Research Center. At least half of the 2-year-old females nest at Patuxent, and almost all of the 3-year-olds nest. As far as we know, this is the first record of nesting by a yearling Canada goose. A

244. Hamilton, W. J. III, and M. C. Hammond. 1960. Oriented overland spring migration of pinioned Canada geese. Wilson Bull. 72(4):385-391.

Adult pinioned Canada geese escaped or were released at several National Wildlife Refuges in Minnesota, Nebraska, and the Dakotas, well south of the natural breeding range of this population. Subsequent sightings and recoveries indicate an accurate northward movement of these earth-bound birds during and

after the period of normal goose migration. Overland movements up to 24.8 air miles were recorded. The rate of progress was more or less uniform throughout the season, ranging from .31 to .74 miles per day. The cues guiding the birds northward are not known, but some possibilities are discussed. WR

245. Hammond, M. C., and G. E. Mann. 1956. Waterfowl nesting islands. J. Wildl. Manage. 20(4):345-352.

A discussion of the construction of nesting islands at Lower Souris National Wildlife Refuge, North Dakota, and their subsequent use by ducks and Canada geese. Costs and construction techniques are included.

246. Hankla, D. J. 1968. Summary of Canada goose transplant program on nine National Wildlife Refuges in the Southeast, 1953-1965. Pages 105-111 in R. L. Hine and C. Schoenfeld, eds. Canada goose management. Dembar Educational Research Services, Madison, Wis. 195 pp.

From 1953-65, 20,734 geese were live-trapped and transferred to nine National Wildlife Refuges in the Southeast. Most were released with the primary feathers pulled in one or both wings. With regard to the goal of restoring and enlarging wintering concentrations, the project was unsuccessful.

247. Hankla, D. J., and R. R. Rudolph. 1967. Changes in the migration and wintering habits of Canada geese in the lower portion of the Atlantic and Mississippi Flyways—with special reference to National Wildlife Refuges. Proc. Annu. Conf. Southeast. Assoc. Game Fish Comm. 21:133-144.

Discussion of wintering population decreases in Florida, North Carolina, Mississippi, Louisiana, and Arkansas. Increases occurred in South Carolina, Maryland, Alabama, Tennessee, and Kentucky. Georgia and Virginia registered no appreciable change. Suggested causes for these changes are as follows: (1) a change in goose food habits, (2) waterfowl management areas, (3) hunting pressure, and (4) disturbance.

248. Hansen, H. A. 1961. Loss of waterfowl production to tide floods. J. Wildl. Manage. 25(3):242-248.

Tidal activity and its relation to waterfowl production were studied on the Yukon-Kuskokwim Delta in 1951. Hatching success of 1,017

eggs produced in 194 successful Canada goose nests was 83.5%. The greatest loss from flooding was due to a lowered viability of the eggs rather than to total destruction of nests.

249. Hansen, H. A. 1962. Canada geese of coastal Alaska. *Trans. N. Am. Wildl. Conf.* 27:301-320.

The migration, mortality, and management implications for two coastal races of Canada geese nesting in Alaska are described. Basic to the study are 1,129 recoveries from 3,943 *Branta canadensis occidentalis* banded on the Copper River Delta between 1951 and 1960 and 164 recoveries from 3,593 *B. c. fulva* banded in and near Glacier Bay between 1956 and 1960. *B. c. fulva*, a sedentary race wintering near its breeding area in southeastern Alaska, is very lightly hunted and requires no special attention at this time. *B. c. occidentalis* winters in the Willamette Valley of Oreg. and is heavily harvested, particularly late in the season. The primary management measure recommended is to terminate hunting Canada geese in five counties of the Willamette Valley soon after Christmas of every year. In conjunction with an early hunting closure, establishment of well-dispersed food patches might also be worth considering as a management practice. WR

250. Hansen, H. A. 1968. Pacific Flyway Canada goose management—federal and state cooperation. Pages 43-49 in R. L. Hine and C. Schoenfeld, eds. *Canada goose management*. Dembar Educational Research Services, Madison, Wis. 195 pp.

251. Hansen, H. A., C. W. McNeil, and M. D. Priebe. 1957. Mortality of Canada geese with impacted gullets in eastern Washington, 1949-1954. *J. Wildl. Manage.* 21(1):96-98.

From 1949 through 1954, 134 Canada geese were found dead on and near the Turnbull National Wildlife Refuge, all of which were severely emaciated and had impacted gullets. Lead poisoning was in evidence but not proved to be lethal. Gizzard worms, *Amidostomum anseris*, were present in above-average numbers compared to normal birds examined and probably were contributory to the death of the geese. Preliminary tests indicated that normal Canada geese had an average of 8.3 milligram per cent uric acid in the blood. [General parasitology of the examined birds is also discussed.] A

252. Hansen, H. A., and H. K. Nelson. 1964. Honkers large and small. Pages 109-124 in J. P. Linduska, ed. *Waterfowl tomorrow*. U.S. Department of the Interior, Washington, D. C. 770 pp.

253. Hansen, H. A., and W. H. Oliver. 1951. The status of resident Canada geese in south-central Washington, spring, 1950. *Murrelet* 32(1):2-7.

Covers a survey of the Columbia River along a 150-mile stretch with respect to the nesting population of Canada geese (*Branta canadensis moffitti*). Number of nests, nesting cover, nest density, and numbers of breeding and non-breeding geese are discussed.

254. Hanson, H. C. 1949. Methods of determining age in Canada geese and other waterfowl. *J. Wildl. Manage.* 13(2):177-183.

Based on data obtained from 3,994 geese handled at Horseshoe Lake, Illinois, criteria are presented for aging Canada geese by examination or measurement of tail feathers, bursa of Fabricius, naked area covering the anal sphincter muscle, penis, and oviduct. A table of these criteria is included.

255. Hanson, H. C. 1949. Notes on white spotting and other plumage variations in geese. *Auk* 66(2):164-171.

Census and trapping operations of the flock of Canada geese wintering at the Horseshoe Lake Game Preserve in Illinois afforded the author an opportunity to observe atypical plumage patterns. White spotting on various body parts, melanism, and somatic mutations are discussed. White spotting was the most common aberrant plumage observed, usually occurring as a white forehead patch, white neck ring, flecking on the neck stocking, or a piebald appearance. Photographic examples are included.

256. Hanson, H. C. 1949. Trapping and handling Canada geese. III. *Nat. Hist. Surv. Biol. Notes* 20. 8 pp.

Presents a summary of trapping and handling techniques as carried out at Horseshoe Lake, Illinois. Included are photographs and diagrams of three trap designs—two types of drop-curtain traps, and one operating with swinging doors. Design and use of holding boxes are also described. Additional hints involve a banding table, use of camouflage, baiting techniques, and use of a cord curtain for funneling geese from trap to holding box.

257. Hanson, H. C. 1951. A morphometrical study of the Canada goose, *Branta canadensis interior* Todd. *Auk* 68(2):164-173.

Description of the measurements of tail length, wing length, and length of exposed culmen as criteria for distinguishing the subspecies of the Canada goose. Measurement differences associated with age and sex are discussed. Tables of measurements are included.

258. Hanson, H. C. 1953. Inter-family dominance in Canada geese. *Auk* 70(1):11-16.

It was observed that a peck-order system exists among the Canada Goose families wintering at Horseshoe Lake, Illinois. The limited number of observations available have further indicated that the main factor influencing dominance among Canada Goose families containing different numbers of individuals is simple superiority of numbers. A

259. Hanson, H. C. 1956. A three year survey of *Ornithofilaria* sp. *Microfilariae* in Canada geese. *J. Parasitol.* 42(5):543.

Three hundred sixty-nine immature geese from Horseshoe Lake, Ill., had infection rates of between 19-29% in different years. Time of infection and effect on health should be studied. WR

260. Hanson, H. C. 1957. Our wild geese—an international heritage. *Ill. Wildl.* 12(4):2.

From his own experiences in the North, Hanson tells what the goose resource means to the Cree Indians, what the muskeg breeding areas of Canada geese are like around Hudson Bay and James Bay, how the adult and young Canadas live and behave, and how different local populations of these birds consistently use particular flyways and winter in traditional areas. Most Canada geese winter on refuges where they can be managed and kills can be observed and regulated. Sport shooting is the critical factor, not killing for food by Indians. The population is high and headed upward and the breeding grounds seem safe. WR

261. Hanson, H. C. 1958. Studies of the physiology of wintering and of molting Canada geese (*Branta canadensis interior*). Ph.D. Thesis. Univ. Illinois, Urbana. 125 pp.

Growth and condition of geese wintering on Ill. refuges were determined by periodic sampling of weights of body, pectoral muscles, and various organs as well as by studies of blood

constituents, histology of femur, and growth of primary feathers. Comparisons were made also between molting and non-molting geese. Yearling geese weighed about 1 lb. more than immatures and adults about 1/3 lb. more than yearlings. Weights were affected by amount of food available. "... in the fasting goose, muscle tissue must be degraded to provide oxalacetate, the catalyst required for the utilization of depot fats. Adequate protein stores, *i.e.* muscle tissue, appear, therefore, to be nearly as important as fat stores for survival in time of inadequate food intake. While molt represents a heavy stress, its chief physiological characteristic is a deficit nitrogen balance." WR

262. Hanson, H. C. 1959. The incubation patch of wild geese: its recognition and significance. *Arctic* 12(3):138-150. [ONS]

263. Hanson, H. C. 1962. The dynamics of condition factors in Canada geese and their relation to seasonal stresses. *Arct. Inst. N. Am. Tech. Pap.* 12. 68 pp.

Body weights of adult Canada geese at or near the end of spring migration exceed that attained at any other period of the year, with the possible exception of the fall migration period. Minimum adult weights are attained in the non-flying stage of the molt. Yearling and incubating females lose weight soon after arrival on the breeding grounds. Gain and loss of fat is the chief cause of weight variation, but a goose in good condition has both fat and protein reserves. Maximum reserves of both fat and protein are carried during migration, and minimum reserves of both are carried during the molting period. The leg and breast muscles vary greatly in size in relation to activity periods, with changes being reciprocal. During the flightless period of the molt, leg muscles increase in size and breast muscles decrease; during the migration period breast muscles increase in size and leg muscles decrease. The study revealed that ♀♀ are stressed more than ♂♂, and it is postulated that the combined effects of the molt and the reproductive process may be the primary reason for fewer females than males in autumn waterfowl populations. It was found that body weights of wintering geese are directly affected by management practices on refuges, food supplies, and the relative size of the wintering goose population. The use of pelleted domestic hays combined with corn and other cereals is suggested as a means of increasing output of food

on refuges. Planting of sunflowers for geese is also recommended as a means for supplying sulfur amino acids needed for replacement of feathers lost after arrival on the wintering ground.—From summ. WR

264. Hanson, H. C. 1965. The giant Canada goose. Southern Illinois University Press, Carbondale. 226 pp.

Rediscovery of *Branta canadensis maxima* in 1962 serves as a basis for a review of all information on the subspecies. Topics of discussion: History of the discovery; Physical characteristics; Breeding range; Migration; Wintering grounds; Nesting; Growth, development, and flightless periods; Characters of age, sex, and sexual maturity; Foods and feeding habits; Endoparasites; Physiology; Behavior; Productivity and regulation of populations; and Management. WR

265. Hanson, H. C. 1967. Characters of age, sex, and sexual maturity in Canada geese. III. Nat. Hist. Surv. Biol. Notes 49. 15 pp.

The following criteria are discussed as a means of establishing sex or age class in Canada geese; plumage characters—tail feathers, primaries, breast, and belly feathers; wing span; cloacal characters—sphincter muscle, bursa of Fabricius, oviduct, and penis; and developmental series. Photographs accompany each description.

266. Hanson, H. C., and C. Curie. 1957. The kill of wild geese by the natives of Hudson-James Bay region. Arctic 10(4):211-229.

Recent increases in the numbers of Canada geese in the Mississippi Flyway have been of some benefit to the Indians of northern Ontario, but the importance of the Indian kill of these geese relative to their numbers decreased between 1946-47 and 1954-56. The Indian kill, not considered a major mortality factor in controlling population levels in the 1940's, is now of even less consequence to over-all population trends of these Canada geese. A

267. Hanson, H. C., and R. E. Griffith. 1952. Notes on the South Atlantic Canada goose population. Bird-Banding 23(1):1-22.

Discusses the breeding grounds, migration routes, wintering range, and annual harvest of the South Atlantic Population of Canada geese of the Atlantic Flyway. Data from the banding and recovery records of the Jack Miner Migra-

tory Bird Sanctuary near Kingsville, Ontario, were utilized with questionnaires sent to fur trade posts by the author, and files of the Branch of Refuges, U.S. Fish and Wildlife Service.

268. Hanson, H. C., and R. L. Jones. 1976. The biogeochemistry of blue, snow, and Ross' geese. III. Nat. Hist. Surv. Spec. Publ. 1. 281 pp.

Appendix 1 deals with the feather mineralogy of the Canada geese of the Belcher Islands.

269. Hanson, H. C., N. D. Levine, and V. Ivens. 1957. Coccidia (Protozoa: Eimeridae) of North American wild geese and swans. Can. J. Zool. 35(6):715-733.

270. Hanson, H. C., N. D. Levine, and S. Kantor. 1956. Filariae in a wintering flock of Canada geese. J. Wildl. Manage. 20(1):89-92.

During the winter of 1953-54, Canada geese (*Branta canadensis interior*) were examined at Horseshoe Lake Refuge, Illinois. Microfilariae of *Ornithofilaria* sp. were found in the blood of 28.8% of 153 juvenile Canada geese, 21.4% of 42 yearlings, and 11.7% of 111 adults. Microfilariae of *Sarconema eurycerca* were found in none of the juveniles, 9.5% of the yearlings, and 4.5% of the adults. A description of the filariae is included.

271. Hanson, H. C., and R. H. Smith. 1947. Preliminary report on the Canada geese of the Mississippi Flyway. III. Nat. Hist. Surv. Biol. Notes 18. 17 pp.

Since 1932 many of the geese that formerly wintered from southern Illinois to Louisiana have concentrated in the vicinity of Horseshoe Lake in southern Illinois. In recent years, the number wintering there has dropped and the kill has been heavy. This led to closing all the states in the Mississippi flyway to goose hunting in 1946. Since 1939, neither refuges nor hunting regulations have been very effective in maintaining this population. Lack of food at Horseshoe Lake and a decrease in the wariness of the birds makes it imperative that they be scattered to islands and bars of the Mississippi River, and that contact with humans be reduced. WR

272. Hanson, H. C., and R. H. Smith. 1950. Canada geese of the Mississippi Flyway, with special reference to an Illinois flock. Bull. Ill. Nat. Hist. Surv. 25 (3):59-210.

This detailed and illuminating report is illustrated with many good maps and photos of the country from southern Hudson Bay to the Gulf of Mexico. It contains a wealth of information on the breeding range, migration, goose behavior, goose hunting in Illinois, other mortality factors, productivity, and survival. The main breeding range lies west of James Bay. The wintering flock at Horseshoe Lake near Cairo, Illinois comprises about 50% of the Mississippi Valley population. Hunting at Horseshoe Lake was for several years greatly in excess of what the flock could stand. "Increased protection . . . plus certain other management practices resulted in an appreciable gain in the population by the fall and winter of 1948-49." WR

273. Hanson, R. 1967. Canada goose management. *Naturalist* 18(2):8-11. [ONS]

274. Hanson, W. C., and R. L. Browning. 1959. Nesting studies of Canada geese on the Hanford Reservation, 1953-56. *J. Wildl. Manage.* 23(2):129-137.

Complete histories were made on 1,032 nests during 1953-56 in southeastern Washington. Nesting density on the islands varied from 0.003 to 4.0 nests per acre. Seventy-one percent of the nests hatched, 13% were destroyed by predators, 11% were deserted, and 3% were flooded. Hatchability of eggs in successful nests averaged 92%; 6% contained dead embryos, and 2% of the eggs in successful nests were infertile. Average clutch sizes were 5.3 in 1953 and 1955, and 5.5 in 1954 and 1956. Peaks of hatching occurred from the third week of April to the first week of May, and varied with the average daily temperature during the 4 years. Total length of the nesting season was 12 weeks in 1953, 11 weeks in 1954 and 1955, and 10 weeks in 1956. The breeding population of approximately 300 territorial pairs produced an estimated 810-980 young per season.

275. Hanson, W. C., and L. L. Eberhardt. 1971. A Columbia River Canada goose population, 1950-1970. *Wildl. Monogr.* 28. 61 pp.

A population study of the western Canada goose, *Branta canadensis moffitti*, conducted since 1950 on the Hanford Atomic Energy Commission Reservation in southeastern Washington. Intensive nesting studies were conducted during 1953-70. The nesting population increased from about 200 pairs in 1950 to a maximum of 300 pairs during 1953-56,

and then declined to about 200 pairs in 1964-70. Nonbreeders numbered 50-150 each year. Chronology of nesting, productivity, banding results, survival, mortality, and management considerations are also discussed. A model of island goose populations is included.

276. Harrison, G. H. 1965. Geese harvested at Pymatuning Management Area. *Pa. Game News* 36(2):40.

The Pymatuning Management Area in Crawford County, Pennsylvania, produced a harvest of 2,069 Canada geese with 700 more taken in the surrounding area during the 1964 season. The age ratio in the kill was 1 adult to 1.26 immature birds, and the sex ratio was 1 male to 1.32 females.

277. Harrison, G. H. 1965. Management pays off. *Pa. Game News* 36(2):1.

An editorial praising the success of management practices at the Pymatuning Waterfowl Area. Controlled shooting from State blinds, limited numbers of hunters per blind, use of silhouette decoys, pursuit of cripples, and limited shooting hours are credited with increasing the quality and quantity of Canada goose hunting at Pymatuning.

278. Helm, L. G. 1951. Effects of Canada geese on crops and soils in central Missouri. M.A. Thesis. Univ. Missouri, Columbia. [ONS]

279. Helm, L. G. 1955. Plastic collars for marking geese. *J. Wildl. Manage.* 19(2):316-317.

A plastic neck collar made from upholsterer's fabric (Koroseal) is described. In use at Swan Lake, Missouri, the collar tended to become brittle and fall off after 4-6 months of exposure. Modifications and applications are discussed.

280. Henderson, B. M., and R. W. Winterfield. 1975. Case report—acute copper toxicosis in the Canada goose. *Avian Dis.* 19(2):385-387.

Acute copper toxicosis resulted in Canada geese (*Branta canadensis*) following ingestion of copper sulfate at about 600 mg/kg from a small man-made pond on a game farm. The lesions were those associated with copper toxicosis in other avian species. The primary pathologic change was necrosis and sloughing of the proventriculus and gizzard. A greenish discoloration of the lungs also occurred. A

281. Henny, C. J. 1967. Estimating band-reporting rates from banding and crippling loss data. *J. Wildl. Manage.* 31(3):533-538.

A new method for estimating band-reporting rates (proportion of bands recovered by hunters that are reported to the Bird Banding Laboratory) is described. This method is dependent upon components obtained from banding data (direct recovery rate, annual mortality rate, and annual natural mortality rate) and crippling loss information. These data are to a large degree already available for waterfowl. The results obtained in my example, involving data from the dusky Canada goose (*Branta canadensis occidentalis*), are in close agreement with band-reporting rates determined for other subspecies of geese in 1966 by Martinson and McCann who used a mail questionnaire survey. The band-reporting rate for the subspecies studied has declined significantly from 49.1 percent for the period 1953-60, to 33.2 percent in 1962 and 1963. A

282. Herman, C. M. 1951. Blood parasites from California ducks and geese. *J. Parasitol.* 37(3):280-282.

Four Canada geese (*Branta canadensis canadensis*) and four cackling Canada geese (*B. c. minima*) were found to be negative in a blood parasite investigation.

283. Herman, C. M. 1966. Some disease problems in Canada geese. Second Annual Canada Goose Ecology Seminar, Seney, Mich. 3 pp. (mimeo)

Leucocytozoon is discussed with respect to its transmission by black flies (*Simulium* sp.) and its 4-year cycle of losses. Also covered are the roundworm of the proventriculus (*Tetrameres*), trypanosomes, and the true malaria, *Plasmodium*. Directions for future research and management in the field of disease control are presented.

284. Herman, C. M., J. H. Barrow, Jr., and I. B. Tarshis. 1975. Leucocytozoonosis in Canada geese at the Seney National Wildlife Refuge. *J. Wildl. Dis.* 11(3):404-411.

285. Herman, C. M., J. O. Knisley, Jr., and E. L. Snyder. 1966. Subinoculation as a technique in the diagnosis of Avian *Plasmodium*. *Avian Dis.* 10(4):541-547.

In two successive years, 1964 and 1965, blood subinoculated from wild Canada geese, negative for *Plasmodium* by examination of

peripheral blood smears, into 5-day-old domestic geese produced 60% infection in the recipients. Prepatent and patent periods, as well as intensity of parasitemia showed much variation. Intramuscular inoculation produced the same prevalence as the intravenous route, but longer prepatent periods and less intensity of parasitemia. WR

286. Herman, C. M., J. H. Stennis, and E. E. Wehr. 1955. Causes of winter losses among Canada geese. *Trans. N. Am. Wildl. Conf.* 20:161-165.

Unexplained mortalities of Canada geese wintering on the South Atlantic coast, especially on Pea Island, North Carolina, were investigated. Gizzard worms and nutritional factors were concluded to be important factors in the die-offs, but no final conclusion was reached.

287. Herman, C. M., and E. E. Wehr. 1954. The occurrence of gizzard worms in Canada geese. *J. Wildl. Manage.* 18(4):509-513.

Amidostomum anseris, a roundworm which occurs under the horny lining of the gizzard in birds, is a widely distributed parasite in Canada geese. It is also reported from snow geese (*Chen hyperborea*). Although the extent of erosion of the gizzard wall by these worms is not precisely correlated with the number of worms present, it is usually severe in Canada geese when 150 or more worms are present.

Gizzard worm infection is considered a contributing factor to low weights, poor condition and to losses among the Canada geese which winter at the Pea Island National Wildlife Refuge in North Carolina. The mean number of gizzard worms per bird is considerably higher for Pea Island than for areas where winter losses have not been reported. A

288. Hess, Q. 1943. Canada geese summering in Northern Ontario. *Can. Field-Nat.* 57(2-3):46.

Geese were located and apparently were nesting in an area of muskeg near the Mattagami River in northern Ontario.

289. Heyland, J. D. 1970. Aircraft supported Canada goose banding operations in arctic Quebec. *Trans. Northwest Fish Wildl. Conf.* 27:187-198. [ONS]

290. Higgins, K. F. 1968. Evaluation of techniques for estimating fall age ratios of Canada and snow geese. M.S. Thesis. South Dakota State Univ., Brookings. 70 pp. [ONS]

291. Higgins, K. F. 1969. Bursal depths of lesser snow and small Canada geese. *J. Wildl. Manage.* 33(4):1006-1008.

Bursa of Fabricius depths of 88 lesser snow geese (*Anser c. caerulescens*) and 69 small Canada geese (*Branta canadensis hutchinsii/parvipes* complex) were measured. Bursal depths were unreliable indicators of age-classes of lesser snow geese and small Canada geese; previously, the same had been found to be true for large Canada geese (*B. c. interior*). Regression in size or closure of the bursa first occurred at 17-20 months of age (yearlings) in lesser snow geese and small Canada geese; but at 29-32 months of age (2-year-olds) in large Canada geese. A

292. Higgins, K. F., R. L. Linder, and P. F. Springer. 1969. A comparison of methods used to obtain age ratios of snow and Canada geese. *J. Wildl. Manage.* 33(4):949-956.

The validity of group counts, cannon-net catches, and hunter-bag checks for estimating productivity of lesser snow geese (*Anser caerulescens caerulescens*) and small Canada geese (*Branta canadensis hutchinsii-parvipes* complex) was studied at Sand Lake National Wildlife Refuge during the falls of 1965 and 1966. Age ratios of snow geese obtained from net-trapped samples were significantly higher ($P < .001$) than from group counts at the same site. Immature snow geese were shot in a significantly greater ($P < .001$) proportion than they existed in the population as determined by group counts. Cannon-net catches and hunter-bag checks of snow and Canada geese yielded age ratios which were biased because of behavioral characteristics of the geese. Immatures of both species were less wary of trap equipment and immature snow geese were more vulnerable to the gun than adults. It was believed that age ratios from group counts of snow geese were more representative of the population than those from net catches and hunter-bag checks. Sex ratios of net-trapped geese showed a preponderance of males for adult Canada and adult and immature snow geese, whereas females were predominant in the immature segment of Canada geese. Hunter selectivity of blue- or white-phase snow geese was not observed at Sand Lake Refuge. Differential vulnerability to hunting between snow and Canada geese resulted from differences in feeding-flight behavior. A

293. Higgins, K. F., and L. J. Schoonover. 1969. Aging small Canada geese by neck plumage. *J. Wildl. Manage.* 33(1):211-214.

The neck plumage method, a new technique for separating immature from adult Canada geese (*Branta canadensis*) in the hand, was evaluated by comparison with the notched tail feather and cloacal examination methods. Two (1.4 percent) of 141 geese examined were mis-aged, resulting in a 6 percent error in the immature-adult ratio obtained by the neck plumage method. The neck plumage method is a rapid aging method and reasonable accuracy (94 percent) can be obtained. It can also be used to differentiate immatures from adults on the ground at distances up to 175 yards, but was almost impossible to use when geese were in flight. As yet, the neck plumage method has only been tested on the subspecies (*B. c. hutchinsii-parvipes* complex) in the Tall-Grass Prairie population of small Canada geese. A

294. Hinz, T. C. 1974. Seasonal activity, numbers, and distribution of Canada geese (*Branta canadensis*) in the Lower Yellowstone Valley, Montana. M.S. Thesis. Montana State Univ., Bozeman. 97 pp. [ONS]

295. Hook, D. L. 1972. Production and habitat use by Canada geese at Freezout Lake, Montana. M.S. Thesis. Montana State Univ., Bozeman. 61 pp. [ONS]

296. Hornocker, M. G. 1969. Goslings descend from aerial nest, attacked by Bald Eagle. *Auk* 86(4):764-765.

A brood of gosling Canada geese (*Branta canadensis*) jumped or fell to the ground from their nest about 50 ft. up in a tree. A bald eagle (*Haliaeetus leucocephalus*) made an unsuccessful attempt to capture the goslings after they had reached the ground. WR

297. Howard, W. J. 1934. Lead poisoning in *Branta canadensis canadensis*. *Auk* 51(4):513-514.

A male Canada goose was captured in St. Clair County, Michigan, on 23 May 1934 and was examined by the author. The bird was weakened, could not fly, and was emaciated. A light green fluid came from the throat and the feces were light green and watery. The proventriculus was greatly distended with plant material and contained seven lead shot pellets. The gizzard contained nine lead shot. Examination and shot content of seven other Canada geese

found dead in other locations are discussed. In these birds pellet content ranged from 2 to 20.

298. Howell, J., and W. Wishart. 1969. Strychnine poisoning in Canada geese. *Bull. Wildl. Dis. Assoc.* 5(2):119.

A case of mortality in Canada geese in Alberta is reported. The geese consumed strychnine-treated gopher bait.

299. Howley, J. P. 1884. The Canada goose (*Bernicla canadensis*). *Auk* 1(4):309-313.

Early ecological observations on the Canada goose in Newfoundland.

300. Hubbard, J. A. 1976. Social organization, dispersion, and population dynamics in a flock of pen-reared Canada geese. Ph.D. Thesis. Univ. Tennessee, Knoxville. 134 pp. [ONS]

301. Huber, W. 1931. Hutchins' goose in Maryland. *Auk* 48(2):259.

A male specimen of *Branta canadensis hutchinsii* was shot on 31 January 1931 on the Bohemia River, Cecil County, Maryland, and presented to the collection of the Academy of Natural Sciences of Philadelphia.

302. Huey, B. 1965. Goose project progress report. *N. M. Wildl.* 10(6):4.

In 1958, 85 goslings were released on the La Cueva Refuge in eastern New Mexico in an attempt to establish a nesting flock. Additional releases were made in subsequent years. Production first occurred in 1961 (2 goslings) and varied in success peaking in 1965 (29 goslings). Management plans and a banding and marking program are discussed.

303. Hughlett, C. A. 1957. Refuge farming practices and Canada goose management. M.S. Thesis. Univ. Wisconsin, Madison. 25 pp.

Farming practices used in goose management at Horicon National Wildlife Refuge are discussed. Canada geese utilized green plants heavily early in the fall and switched to corn and buckwheat as the fall progressed. Individual geese consumed 0.58 to 0.70 pound of corn per day when feeding solely on corn. Knocking down standing corn was effective at holding geese on the Refuge.

304. Hunt, R. A. 1964. Hunting Horicon honkers. *Wis. Conserv. Bull.* 29(5):15-16.

With 2,300 bagged of the 50,000 Canada

geese on Horicon Marsh in 1954 and 7,000-12,000 of the 100,000 annually bagged in recent years, the Canada goose population has increased under management. This article is an account of how the increase was attained. WR

305. Hunt, R. A. 1966. Lead poisoning wastes waterfowl. *Wis. Conserv. Bull.* 31(6):18-19.

Review of lead poisoning: history in Wisconsin, importance, pathology, and possible solutions, including nontoxic shot and better shooting habits.

306. Hunt, R. A. 1968. Shell limits and other regulations used in managed goose hunting. Pages 123-139 in R. L. Hine and C. Schoenfeld, eds. *Canada goose management*. Dembar Educational Research Services. Madison, Wis. 195 pp.

Use of a shell limit to curb "sky busting" is evaluated through data on managed hunts at Horicon Marsh. An extensive table compares other regulations used in managed goose hunting at other concentration areas in the United States to improve the quality of the hunting experience. Harvest data, hunter success, goose populations, and a general description of the management scheme are included for each area.

307. Hunt, R. A., and J. G. Bell. 1973. Crop depletions by waterfowl in Wisconsin. Pages 85-101 in *Proceedings of the 6th Bird Control Seminar*, Bowling Green State Univ., Bowling Green, Ohio.

308. Hunt, R. A., J. G. Bell, and L. R. Jahn. 1962. Managed goose hunting at Horicon Marsh. *Trans. N. Am. Wildl. Conf.* 27:91-106.

Canada goose populations increased during 1949-61 from 12,000 to 100,000. By 1952, 60% of the hunter trips and 32% of the kill occurred along roads and railroad tracks. Hunters averaged 6.5 trips per year, 2 hours per trip, 0.08 geese per trip, and fired 27 shots per goose bagged. In 1953 a managed hunting unit was established on the periphery of the federal refuge. During 1953-1959 the managed unit accounted for 46.1% of the hunter trips. During 1958-61 hunters in the managed unit averaged 0.52 geese per trip. Regulations evaluated in the managed unit included: (1) season bag limit of 2 Canada geese (1953-55), (2) season limit of 3 trips per hunter, (3) mail-type reservation system, and (4) restricting the daily bag limit to 1 goose of any species (1960-61). Regu-

- lations established on private lands included: (1) prohibiting hunting on road and railroad tracks, (2) moving blinds 75 yards back from the refuge boundary, and (3) requiring a 200-yard spacing of blinds. Two regulations effective in increasing the harvest in the years 1957-59: (1) a delayed opening to mid-October, and (2) a 2:00 p.m. daily closing in a zone surrounding the refuge. The increasing kill at Horicon Marsh resulted in the development of a harvest quota system for the Mississippi Valley Canada goose population. WR
309. Hunt, R. A., and H. C. Hanson. 1975. The spring Canada goose migration in Wisconsin. *Wis. Conserv. Bull.* 40(2):7-9.
- Canada geese migrating through Wisconsin in the spring are associated with the Mississippi Valley Goose population. Timing and influence of weather on the migration are discussed. Annual weight changes for adult geese are presented.
310. Hunt, R. A., and L. R. Jahn. 1966. Canada goose breeding populations in Wisconsin. *Wis. Conserv. Dep. Tech. Bull.* 38. 67 pp.
- Year-round hunting, stealing of eggs and young, and habitat destruction had largely eliminated the breeding population of Canada geese in Wisconsin by about 1900. The Wisconsin Conservation Department began Canada goose restoration attempts in 1946. The only success has been in projects started with proven breeders confined in pens. Free-flying progeny from such projects have resulted in self-perpetuating migratory flocks at Horicon Marsh, Crex Meadows, and to a limited extent at Powell Marsh. Other restoration projects, goose flocks in Wisconsin, and management and research implications are discussed.
311. Hunt, R. A., and C. W. Lemke. 1961. Canada goose quotas. *Wis. Conserv. Bull.* 26(5):8-9.
- The procedures involved in determining harvest quotas for Wisconsin and in general are discussed. These include wintering population surveys and the percentage of breeding-age geese in the population. The major factors used to determine the quota partitioning between Wisconsin and Illinois are presented. Questionnaire and survey techniques used to monitor the closure time necessary to remain within the quotas are presented with overall success and public opinion of the program on a Wisconsin basis.
312. Hunt, R. A., D. R. Thompson, A. J. Rusch, and G. F. Martz. 1963. Some results of goose hunting regulations at Horicon Marsh, Wisconsin, in 1963. *Midwest Wildlife Conference*. 7 pp. (mimeo)
313. Hutt, A. 1967. Canada goose story. *Fla. Wildl.* 21(1):18-21. [ONS]
314. Hyde, R. K. 1958. Florida waterfowl band recoveries 1920-1957. *Florida Game Fresh Water Fish Commission*. 57 pp.
- Includes a report on the distribution of band returns from Canada geese banded in Florida and recovered elsewhere (45) and banded elsewhere and recovered in Florida (11). Also mentioned are the fates of a number of geese trapped, banded, and released at Chassahowitzka National Wildlife Refuge in an attempt to establish it as a wintering area.
315. Hyer, R. R. 1970. Survival of released pen-reared Canada goslings. *Indiana Division of Fish and Game*. 3 pp. [ONS]
316. Imber, M. J. 1968. Sex ratios in Canada goose populations. *J. Wildl. Manage.* 32(4):905-920.
- In a New Zealand population of Canada geese, 45.5% of 14,379 banded adults were males. The proportion of males decreased with age. Mean annual mortality rates were (from recaptures) 31.2% of males and 28.5% of females. Reasons for the excess vulnerability of males are discussed. An implication is that, since sex ratios among juvenile waterfowl are normally equal, these, and perhaps other, Canada goose populations contain more adult females than adult males.
317. Imber, M. J. 1971. Canada goose. Pages 44-47 in *New Zealand Wildlife Service, Wildlife Review*. 1971. [ONS]
318. Imber, M. J. 1971. The identity of New Zealand's Canada geese. *Notornis* 18(4):253-261.
- Canada Geese (*Branta canadensis*) became established in New Zealand following the introduction of 50 from central or eastern U.S.A. in 1905. In 1920 ten more were brought from western Canada. Examination of plumage, weights and measurements of the present population shows that it belongs predominantly to the giant race *B. c. maxima* Delacour. There is a possibility that *B. c. canadensis* interbred to a limited extent with it. Behaviourally and eco-

logically *maxima* appears very well suited to the South Island habitats in which it multiplied quickly. A

319. Imber, M. J., and G. R. Williams. 1968. Mortality rates of a Canada goose population in New Zealand. *J. Wildl. Manage.* 32(2):256-267.

Between 1957 and 1967 inclusive, 14,435 Canada geese were banded in molt at Lake Ellesmere, New Zealand. The majority of the birds were 1 year and older nonbreeders of a migratory population. The first year recovery rate of geese shot from 1957-62 was 4.1%; mean annual mortality was 17%, approximately 10% natural and 7% by hunting. From 1963-66, recovery rate was 13.6%, and mean annual mortality was 33% for birds over 3 years of age. Productivity of both groups, and additional mortality breakdowns, are discussed.

320. Jahn, L. 1955. Canada geese listed as "vermin" in New Zealand. *Mod. Game Breed. Hunt. Club News* 26(5):15.

Introduced Canada geese thrive in N. Z. and they are nonmigratory. The objection to them is that they compete with sheep for grass. They occupy rather inaccessible lake country and are seldom taken by hunters. Drives occasionally are organized to control the geese. WR

321. Jahn, L. R., L. Gunther, and J. G. Bell. 1954. The managed goose hunt—Horicon Marsh, 1953. *Wis. Conserv. Bull.* 19(3):6-11.

Justification and explanation for the Horicon Marsh managed goose hunt in 1953. Harvest and derivation of hunters are discussed.

322. Jahn, L. R., and R. L. Hine. 1952. What about goose refuges? *Wis. Conserv. Bull.* 17(12):12-13.

Wisconsin has found that creation of new goose refuges does not lessen use of previous refuges but simply causes more geese to stop in the state. About 40,000 Canadas now pause in Wisconsin for varying periods. "The honkers will probably hold their own in the Mississippi flyway states if refuges established for them are not gunning traps, if they furnish sufficient feed to last the flock until freezing weather pushes them south, and if the harvest of geese both in the north and in the south does not exceed 20 per cent of the total flyway population." WR

323. Jarvis, R. L. 1969. Ecological and physiological aspects of soybean impaction in Canada geese.

Ph.D. Thesis. Southern Illinois Univ., Carbondale. 118 pp.

Impactions form only when large quantities of soybeans are ingested; only then is the pressure generated by the swelling soybeans exerted against the esophageal wall. Feeding patterns and behavior of geese may be conducive to ingestion of large quantities of food in early fall. Drinking was not essential to impaction formation since secretions from mucous glands provide sufficient water for maximum swelling of soybeans. Chronic impactions resulted when soybeans distended the fusiform crop region of the esophagus. The pressure exerted against the esophagus produced necrosis because of restriction of local blood flow, and the blocked esophagus resulted in starvation. WR

324. Jarvis, R. L. 1976. Soybean impaction in Canada geese. *Wildl. Soc. Bull.* 4(4):175-179.

Acute and chronic soybean impaction in Canada geese are discussed. At Crab Orchard National Wildlife Refuge, mortality was influenced by October rainfall, corn harvest chronology, and goose migration chronology. Annual mortality averaged about 7% of the October population.

325. Jenkins, D. W. 1944. Territory as a result of despoticism and social organization in geese. *Auk* 61(1):30-47.

Six Canada geese were included in a study of social organization and territory.

326. Jennings, D. M., P. J. Bunyan, P. M. Brown, P. I. Stanley, and F. J. S. Jones. 1975. Organophosphorus poisoning: A comparative study of the toxicity of carbophenothion to the Canada goose, the pigeon and the Japanese quail. *Pestic. Sci.* 6(3):245-257. [ONS]

327. Jewett, S. G. 1949. The nesting population of the Canada goose in the Pacific Northwest. *Trans. N. Am. Wildl. Conf.* 14:87-94.

An estimate of 8,600 pairs of nesting geese is presented for California, Oregon, and Washington.

328. Joanen, T., and H. Dupuie. 1968. Home grown! Cajun Canadas. *La. Conserv.* 20(7&8):4-5. [ONS]

329. Johnsgard, P. A. 1968. Waterfowl: Their biology and natural history. University Nebraska Press, Lincoln. 138 pp.

330. Johnson, C. S. 1947. Canada goose management, Seney National Wildlife Refuge. *J. Wildl. Manage.* 11(1):21-24.
- Ten years of study and management of the Canada goose at the Seney National Wildlife Refuge yields the following conclusions: (1) Nesting birds cannot be crowded; not more than one nesting pair to each half acre or acre of nesting territory has been found desirable. (2) Seney-bred geese move mainly along the Mississippi Flyway, but are of most importance to local hunters. (3) Birds produced on the refuge return to the area of origin following their southern migration, but further banding is needed to determine the percentage that returns. [A description of the Seney area and its early development is included.] A
331. Johnson, L. L. 1972. Characteristics of the Canada goose harvest on the Roseau River Wildlife Management Area in the fall of 1971. *Minn. Dep. Nat. Resour. Q. Rep.* 31(4):245-250. [ONS]
332. Johnson, S. 1977. White-tailed eagle *Haliaeetus albicilla* attacking Canada goose *Branta canadensis*. *Var. Fagelvarld* 36(1):54. [ONS]
333. Johnson, W. C. 1967. Peripheral blood analysis as an index to reproductive condition in the Canada goose. M. S. Thesis. Michigan State Univ., East Lansing. 81 pp. [ONS]
334. Jones, R. D., Jr. 1963. Buldir Island, site of a remnant breeding population of Aleutian Canada geese. *Annu. Rep. Wildfowl Trust* 14:80-84.
- Recent observations of the once abundant Aleutian Canada Goose *Branta canadensis leucopareia* are reviewed. The introduction of Blue Foxes to the breeding grounds and increased hunting pressure are suggested as reasons for the decline of the race, with a note concerning the production potential of the Blue Fox. An expedition to Buldir Island, where no fox introduction has been made, is recounted along with a discussion of the island's topography, climate, avian and mammalian populations. Reestablishment of the Sea Otter at Buldir Island is noted. A breeding population of *B. c. leucopareia* was observed and the conditions of the habitat are discussed. A
335. Jones, R. N., and M. Obbard. 1970. Canada goose killed by Arctic loon and subsequent pairing of its mate. *Auk* 87(2):370-371.
- A male small Canada goose was killed by a single bill thrust from an Arctic loon at the McConnell River, Northwest Territories, on 10 June 1967. The female remained at the same nest site and copulated with a new mate.
336. Joselyn, G. B. 1961. Some aspects of the economics of the Canada goose in southern Illinois. M. S. Thesis. Southern Illinois Univ., Carbondale. 122 pp. [ONS]
337. Kaczynski, C. F., and E. B. Chamberlain. 1968. Aerial surveys of Canada geese and black ducks in eastern Canada. *U.S. Fish Wildl. Serv., Spec. Sci. Rep.—Wildl.* 118. 29 pp.
- Information for Canada geese gathered during the summers of 1956 and 1962-66 is presented. Canada geese show extreme variations in density in eastern Canada. The estimated number of geese in Canada east of James and Hudson bays approximates the number accounted for by Atlantic Flyway winter survey and kill estimates. Included are survey methods, goose density strata, estimates of confidence limits and optimum sample allocation for the stratified goose survey, Canada goose summer indexes compared with winter survey and kill statistics, Canada goose summer survey and hunting regulations, and Canada goose breeding population and production survey.
338. Kaminski, R. M., and J. M. Parker. 1976. Investigations of nesting giant Canada geese in southeastern lower Michigan. *Mich. Dep. Nat. Resour., Wildl. Div. Rep.* 21 pp. [ONS]
339. Katz, M. 1941. Selected publications on waterfowl and gallinaceous game birds—with special reference to propagation and management. *U.S. Dep. Inter., Wildl. Leaflet* 192. 42 pp. [ONS]
340. Kear, J. 1970. The experimental assessment of goose damage to agricultural crops. *Biol. Conserv.* 2(3):206-212.
- Effects of goose grazing on cereal and grass crops in Britain are examined. Canada geese are compared to the greylag and pinkfooted geese. Several American studies involving Canada geese are reviewed.
341. Kennard, F. H. 1912. A peculiar plumage of the Canada goose. *Auk* 29(3):391.
- On 29 November 1911 a male Canada goose was shot near Plymouth, Massachusetts. The bird's head was entirely black, with the excep-

tion of a few lighter colored feathers on its throat.

342. Kennedy, D. D., and G. C. Arthur. 1974. Subflocks in Canada geese of the Mississippi Valley population. *Wildl. Soc. Bull.* 2(1):8-12.

Differential harvest rates of early- and late-migrating Canada geese (*Branta canadensis*) derived from harvest records and aerial inventories from the southern Illinois quota zone correlate with the population of each segment and with the population at separate refuges. On these relationships a working hypothesis is proposed of an early-migrating segment and refuge subflocks with the Mississippi Valley Population in southern Illinois. An early segment, migrating in October and early November to southern Illinois refuges, constitutes approximately one third of the winter population. Other population segments, remaining in Wisconsin until severe weather forces their exodus, are affiliated more with Horseshoe Lake and Union County state refuges than with Crab Orchard National Wildlife Refuge. Subflocks associated with each of the concentration points exist in the early segment. Low annual harvest rates (about two percent) of the early segment at the Crab Orchard have permitted an increase in that subflock. Harvest rates on the early-segment subflocks at Horseshoe Lake and Union County averaged 11 and 10 percent respectively from 1968-1971; these areas do not show population increases. A

343. Khalili, A. 1969. Optimal economic management of wildlife, over time, with special reference to Canadian geese of the Swan Lake Wildlife Refuge. Ph.D. Thesis. Univ. Missouri, Columbia. 189 pp. [ONS]

344. Kiehlbauch, W. 1938. Geese easy to raise. *S. D. Conserv. Dig.* 5(11):6-8.

Account of rearing the birds on "three city lots." In preparation for the breeding season, oats both whole and sprouted with a little corn are fed. First clutches of 6-8 are removed and in about ten days the females again start laying and produce 5-6 more eggs. The young are fed some oatmeal but they and the adults as well subsist largely upon grass. Contrary to the usual experience, this breeder found that some geese losing mates will pair again in a short time. WR

345. Kiracofe, J. 1964. Aleutian Island Canada goose—progress in its survival. *Game Bird*

Breeders Gaz. 13(2):12-13.

Sixteen goslings were captured and raised in 1963 for breeding stock from which surplus birds may be re-introduced in the Aleutians. WR

346. Klopman, R. B. 1958. The nesting of the Canada goose at Dog Lake, Manitoba. *Wilson Bull.* 70(2):168-183.

Geese began nesting while lake was still frozen in 1954 and 1955. Start of nesting was about 43 days later and the season was shorter than reported from ne. Calif. Of the 104 nests, 94% were on islands, most of which were small. Breeding densities were high, up to 15 nests on 1/6 acre. Minimum distance between active nests was 9 yards. Earliest nests on islands were not as far apart as possible, and nearest-neighbor distance decreased as number of nests increased. Site selection apparently was influenced by social interactions between pairs. Nest success was 61% in 1954, 35% in 1955. Flooding caused more than half of nest failures. Predation and desertion together accounted for about 40% of nest failures. Main predators were foxes, gulls, and men. Desertion was caused mainly by friction with other species of nesting birds. Hatching period extended from May 28 to June 17 in 1954 and from May 15 to June 8 in 1955. Mean clutch size was 5.0 ± 2.5 eggs in 1954, 5.2 ± 2.5 in 1955. Number of young per successful nest increased from 4.8 to 5.5, but number of young believed to have left nests dropped from 129 to 115. WR

347. Klopman, R. B. 1959. Certain aspects of the social behavior of the Canada goose (*Branta canadensis canadensis*). Ph.D. Thesis. Cambridge Univ., Cambridge. [ONS]

348. Klopman, R. B. 1961. The greeting ceremony of Canada geese. *Mag. Ducks Geese* 12(11):6-9.

The greeting display may be seen in 3 different behavioral situations: (1) in close association with attack and related behavior, (2) as an aftermath of some general disturbance, and (3) when an individual returns to the group after a period of separation from it. Comparisons are made between threat, attack, and greeting displays. Descriptions are given of the various displays and their accompanying vocalizations. Greeting has survival benefit for the species because it contributes to the solidarity and synchronous behavior of the group. Greeting is also closely tied to the aggressive force which prevents intrusion by non-group members. WR

349. Klopman, R. B. 1962. Sexual behavior in the Canada goose. *Living Bird* 1:123-129.
- The study was conducted in Norfolk, England, with a semiwild concentration of Canada geese; descendants from introductions of both *Branta canadensis canadensis* and *B. c. interior*. Behavior associated with periods before, during, and after copulation are discussed. Other displays of Canada geese are mentioned.
350. Klopman, R. B. 1968. The agonistic behavior of the Canada goose (*Branta canadensis canadensis*). 1. Attack behavior. *Behaviour* 30(4):287-319.
- Canada geese used were taken from a wild resident population in England. The attack behavior of these captive geese was then studied in winter. An analysis of responses deals mainly with the head and neck units and utilizes evidence from several independent sources.
351. Knight, E. T., and D. Dominick. 1967. The egg express. *Colo. Outdoors* 16(6):16-17. [ONS]
352. Koerner, J. W. 1971. Fall movements of Canada geese near southwestern Lake Erie. M.S. Thesis. Ohio State Univ., Columbus. 150 pp. [ONS]
353. Koerner, J. W., T. A. Bookhout, and K. E. Bednarik. 1974. Movements of Canada geese color-marked near southwestern Lake Erie. *J. Wildl. Manage.* 38(2):275-289.
- Canada geese utilizing the marshes of southwestern Lake Erie were observed in 1969-70 to ascertain their local movements, flight patterns, area of use, and relationship to the Tennessee Valley Population of Canada geese. Three subflocks identified on the basis of roosting and feeding locations corresponded to the three trapping sites where they were marked. Population data, effects of weather on hunting, and wintering areas are discussed.
354. Kondla, N. G. 1973. Canada goose goslings leaving cliff nest. *Auk* 90(4):890.
- Account of five goslings descending from a nest on an ironstone outcropping of a cliff 50 feet above level ground. All five goslings survived without apparent injury.
355. Kortright, F. H. 1942. The ducks, geese and swans of North America. American Wildlife Institute, Washington, D.C. 476 pp.
356. Kossack, C. W. 1947. Incubation temperatures of Canada geese. *J. Wildl. Manage.* 11(2):119-126.
- The study was initiated in 1944 on the Bright Land Farm in Cook County, Illinois. A flock of about 250 Canada geese were maintained. Ten of 76 eggs obtained from abandoned or flooded nests were hatched in an electric incubator with temperatures maintained at 99.5°F at the upper egg surface and 93°F at the lower egg surface. The poor hatching success was investigated as a function of improper incubator temperature. The natural average incubation temperature of the embryo was found to be 101.3°F; the breast temperature of the incubating goose 101.1°F. The electric incubator top temperature should be raised 1.5° to 2°.
357. Kossack, C. W. 1950. Breeding habits of Canada geese under refuge conditions. *Am. Midl. Nat.* 43(3):627-649.
- Breeding biology is discussed for a captive flock of Canada geese at the Bright Land Farm, Barrington, Illinois, from 1944 to 1948. All birds were numbered and color-coded. Few geese nested when 2 or 3 years old. Most pairs were of the same age. Sixteen birds separated from their mates selected new mates. Three cases of polygamy were recorded but desertion was rare. Nest selection, site preference, and building materials are discussed. Laying starts 11 to 14 days after a territory is claimed and the nesting period lasts about 60 days. Clutch size ranged from two to eight eggs. Incubation, hatching, and gosling behavior are discussed.
358. Kozicky, E. L. 1949. An abnormality in a Canada goose. *Auk* 66(2):197.
- An emaciated Canada goose was captured in Tuckahoe, New Jersey, on 1 April 1948. Autopsy revealed that the lower esophagus and proventriculus were severely impacted with a mixture of sand and vegetable material. No parasites were found.
359. Krapu, G. L. 1976. Experimental responses of mallards and Canada geese to tribromoethanol. *J. Wildl. Manage.* 40(1):180-183.
- Tribromoethanol-treated grain was tested on wild-captured, penned Canada geese to determine its effectiveness as a waterfowl capture technique. Because of problems with partially anesthetized birds escaping from a bait site, its use was not recommended. Dosages and other problems are discussed.

360. Kuck, T. L. 1970-1977. Investigations into rearing and restoration of breeding Canada geese (*Branta canadensis*) in South Dakota, 1968-1977. South Dakota Department of Game, Fish and Parks. 1970 P-R Rep., Proj. W-75-R-11; 1971 P-R Rep., Proj. W-75-R-12; 1972 P-R Rep. Proj. W-75-R-13; 1973 P-R Rep. Proj. W-75-R-14; 1974 P-R Rep. Proj. W-75-R-15 & 16; 1975 P-R Rep. Proj. W-75-R-17; 1976 P-R Rep. Proj. W-75-R-18; and 1977 P-R Rep. Proj. W-75-R-19. [ONS]
361. Kuck, T. L. 1973. Analysis of waterfowl band recoveries, 1972-73. Recovery analysis of the Waubay Canada goose flock 1961-71, South Dakota. South Dakota Department of Game, Fish and Parks. P-R Rep. W-75-R-14. 23 pp. [ONS]
362. Kuck, T. 1974. Fight to restore giant Canadas in South Dakota. South Dakota Department of Game, Fish and Parks. P-R Rep. W-075-R. 16 pp. [ONS]
363. Kurtz, J. E. 1962. An analysis of gizzard contents from migrant geese in southwestern Michigan. M.S. Thesis. Univ. Michigan, Ann Arbor. 52 pp. [ONS]
364. Kuyt, E. 1962. Northward dispersion of banded Canada geese. *Can. Field-Nat.* 76(3):180-181.
Initial evidence of a molt-migration of Great Basin Canada geese (*Branta canadensis moffitti*) to the District of Keewatin, Northwest Territories, based on several band recoveries and color-band observations is presented.
365. Kuyt, E. 1966. Further observations on large Canada geese moulting on the Thelon River, Northwest Territories. *Can. Field-Nat.* 80(2):63-69.
Discussion of the races, origin, and migration routes of the Canada geese which molt on the Thelon River, Northwest Territories. Weight data, recaptures in the Northwest Territories, and recoveries of banded birds from the Northwest Territories are included.
366. LaMarche, E. D. 1972. Radar monitoring of the departures of *Branta canadensis* from the Horicon Refuge Area, 1970 fall migration. M. S. Thesis. St. Mary's College, Winona, Minnesota. 53 pp.
A radar screen at an FAA radar installation in Mayville, Wisconsin, was monitored 24 h a day with 16mm time-lapse photography during fall goose migration periods. Magnitude of migration, directional orientation, temporal patterns, and weather correlations are discussed.
367. Lamprecht, J. 1977. A comparison of the attachment to parents and siblings in juvenile geese, *Branta canadensis* and *Anser indicus*. *Z. Tierpsychol.* 43(4):415-424.
Ten hand-reared goslings of each of the species *Branta canadensis* and *Anser indicus* living in a flock of mostly 8-10 individuals until 2.5 to 6.5 days of age, were tested for their reactions to a 5-minute separation from their human foster parent or from one sibling. They showed signs of great distress (distress calls, increased locomotion) when separated from the parent, whether a sibling was present or not. Separation from a sibling caused distress only when the parent was also absent, and only in a test room in which the goslings had little previous contact with the parent. The results indicate that under normal conditions a gosling would be distressed by the absence of its parents, but not by the absence of its siblings. This suggests that proximity to siblings is not the consummatory situation the gosling is aiming at, but that the young gosling uses its siblings as a means to maintain or restore contact to the vitally necessary parent. A
368. Lebret, T. 1956. Are group size counts of wild geese an index of productivity? *Ardea* 44:284-288.
Data on group counts from several species and sources produced the following conclusions: (1) In wild geese small groups are not necessarily identical to families, "pseudo-families" being a regular phenomenon. (2) Group size counts therefore cannot be used as an index for productivity or shooting pressure. (3) Only true family counts can be used for this purpose. (4) Counts of this type can only be collected in those species where juveniles can easily be distinguished in flight. A
369. Leck, C. F. 1968. A possible hybrid between the Canada goose and the pink-footed goose. *Cassinia* 50:9-11.
370. Lee, F. B., A. D. Kruse, and C. H. Schroeder. 1973. Canada goose restoration in North Dakota. *N. D. Outdoors Mag.* 35(8):18-21.
Discusses liberation of 900 juvenile giant Canada geese (*Branta canadensis maxima*) in

North Dakota during the summer of 1972 as the first part of a 5-year program to restore nesting geese to many parts of the State. Management practices and goals involved are discussed.

371. LeFebvre, E. A., and D. G. Raveling. 1967. Distribution of Canada geese in winter as related to heat loss at varying environmental temperatures. *J. Wildl. Manage.* 31(3):538-546.

By means of thermal modeling, the heat loss of an organism under varying conditions can be calculated. This paper utilizes this technique and discusses the heat balance for two different sized races of Canada geese (*Branta canadensis maxima* and *B. c. parvipes*). We conclude that the northernmost limits of distribution for these subspecies can be predicted from the calculated heat losses and the extended maintenance level of energy intake attained under natural environmental conditions. The relationship between body surface heat-generating potential helps explain the role of temperature as a factor limiting animal distribution, as illustrated by Bergmann's rule. Some management implications are discussed with regard to the factors limiting northern wintering distributions in the Canada goose. A

372. Lehman, L. 1970. Effects of nesting Canada geese on raccoon activity and density. Indiana Division of Fish and Game. 5 pp. (mimeo) [ONS]
373. Lengkeek, D.L. 1973. Evaluation of giant Canada goose restoration in western South Dakota. M.S. Thesis. South Dakota State Univ., Brookings. 66 pp. [ONS]
374. Lenzer, G. 1972. Canadian geese in June near Hiddensee. *Falke Monatsschr Ornithol. Vivarienkd. Ausg. A.* 19(8):283. [ONS]
375. Levine, N. D. 1952. *Eimeria magnalabia* and *Tyzzeria* sp. (Protozoa: *Eimeriidae*) from the Canada goose. *Cornell Vet.* 42(2):247-252.
376. Levine, N. D., and H. C. Hanson. 1953. Blood parasites of the Canada goose, *Branta canadensis interior*. *J. Wildl. Manage.* 17(2):185-196.

In a study of blood smears from 353 Canada geese (*Branta canadensis interior*) collected at Horseshoe Lake Game Refuge, Illinois, *Leucocytozoon simondi* was found in 32 (9.1%), *Haemoproteus* sp. in 5 (1.4%), *Plasmodium* sp. (probably *P. circumflexum*) in 1 (0.3%) and microfilariae in 4 (1.1%). Two types of un-

sheathed microfilaria were found, one 65 and the other 332 microns long. *Leucocytozoon* was found in 27.6% of 76 juvenile geese, 5.4% of 112 yearlings, and 3.0% of 165 adults. *Haemoproteus* was found in no juveniles, 0.9% of the yearlings, and 2.4% of the adults. Microfilariae were found in 1.3% of the juveniles, 0.9% of the yearlings, and 1.2% of the adults. A

377. Lief, B. C. 1967. The feeding behavior of geese in the McConnell River Delta, Northwest Territories. M.S. Thesis. Univ. Western Ontario, London. 81 pp. [ONS]
378. Lief, B. C. 1973. The summer feeding ecology of blue and Canada geese at the McConnell River, Northwest Territories. Ph.D. Thesis. Univ. Western Ontario, London. 203 pp. [ONS]
379. Lief, B. C., C. D. MacInnes, and R. K. Misra. 1970. Food selection experiments with young geese. *J. Wildl. Manage.* 34(2):321-327.
- Young Canada geese (*Branta canadensis*) and blue geese (*Chen caerulescens*) were tested experimentally for food preferences among six species of grasses and sedges. Fifty-square-centimeter sods of two plant species were presented to two goslings in a test enclosure. The time intervals that individual birds spent feeding on each sod during a 90-minute test were recorded. Two pairs of goslings of each species were tested against all pair combinations of the six plants. Each species shows significant preference for some plants over others, and the preferences of the two species were demonstrably different. Faults in experimental design are discussed, and it is shown that results cannot be extended directly to free-ranging wild geese. A
380. Lish, J. W., and J. C. Lewis. 1975. Status and ecology of bald eagles wintering in Oklahoma. *Proc. Annu. Conf. Southeast. Assoc. Game Fish Comm.* 29:415-423.
381. Lloyd, H. 1923. Observations on the wintering flocks of Canada geese in Nova Scotia. *Can. Field-Nat.* 37(2):26-28.
382. Locke, L. N. 1963. Multicentric neurofibrosarcoma in a Canada goose, *Branta canadensis*. *Avian Dis.* 7(2):196-202.

A case of a probable multicentric neurofibrosarcoma is reported from a wild-trapped female Canada goose captured on the Eastern Shore of Maryland. WR

383. Locke, L. N., and G. E. Bagley. 1967. Case report: Coccidiosis and lead poisoning in Canada geese. *Chesapeake Sci.* 8(1):68-69.
- Four dead Canada geese (*Branta canadensis* L.) collected at the Prime Hook National Wildlife Refuge, Delaware were found to have both marked duodenal lesions of coccidiosis and high levels of lead in the liver. Although only one goose had lead shot in the gizzard, all four had levels of lead in the liver suggestive of lead poisoning. WR
384. Locke, L. N., G. E. Bagley, and L. T. Young. 1967. The ineffectiveness of acid-fast inclusions in diagnosis of lead poisoning in Canada geese. *Bull. Wildl. Dis. Assoc.* 3(4):176.
- "It thus appears that birds, particularly Canada geese, receiving a large exposure to lead may succumb without the formation of intranuclear acid-fast inclusions in the kidneys. The authors believe that a period of exposure of several days is required before the bird can respond by producing these inclusions." WR
385. Low, S. H. 1935. A coastal group of Canada geese. *Bird-Banding*, 6(2):67-68.
- Recoveries of 26 Canada geese banded during black duck banding operations in Massachusetts are discussed; all were recovered in the Canadian maritime Provinces or on the eastern coast of the United States.
386. Lowe, P. R., and others. 1941. International wildfowl inquiry. Vol. I. Factors affecting the general status of wild geese and wild duck. Cambridge University Press, Cambridge, England. 123 pp. [ONS]
387. Lumsden, H. G., and D. G. Raveling. 1968. Kinoje Lake Canada goose nesting study. Ontario Department of Lands Forests Progress Report. 11 pp. [ONS]
388. Lynch, J. J. 1961. Age-group as an indicator of productivity in Canada geese. Pages 12-14 in J. J. Lynch. 1961 reproductive success in North American geese. U.S. Bur. Sport Fish. Wildl. [ONS]
389. MacInnes, C. D. 1960. The Canada geese (*Branta canadensis*) of the McConnell River. M.S. Thesis. Cornell Univ., Ithaca, N.Y. 77 pp. [ONS]
390. MacInnes, C. D. 1962. Nesting of small Canada geese near Eskimo Point, Northwest Territories. *J. Wildl. Manage.* 26(3):247-256.
- Small Canada geese of the *hutchinsii-parvipes* group nested on sphagnum-covered islets in the flat coastal sedge marshes near the McConnell River. A total of 119 nests were studied, in an average density of 6.5 per square mile. A large colony of blue geese in the same area contained as many as 1,000 nests per square mile. The nesting period approached the minimum possible (30 days). This is the shortest recorded for any of the subspecies of the Canada goose. Normal clutch size was five. Incubation required 24 or 25 days. Parasitic jaegers and herring gulls caused egg losses of 20 percent in 1959 and less than 5 percent in 1960. The difference was due chiefly to reduced jaeger predation in 1960, apparently the result of high lemming population. Production was 64 percent of maximum in 1959, and 81 percent in 1960, comparing favorably with that reported for other subspecies in more southern breeding areas. A
391. MacInnes, C. D. 1963. Interaction of local units within the eastern Arctic population of small Canada geese. Ph.D. Thesis. Cornell Univ., Ithaca, N.Y. 128 pp. [ONS]
392. MacInnes, C. D. 1966. Population behavior of eastern arctic Canada geese. *J. Wildl. Manage.* 30(3):536-553.
- The Canada geese (*hutchinsii-parvipes* complex) which nest in arctic Canada east of 104° W have developed a complex system which enables the population to survive and expand its range under the changing ecological conditions of its present breeding grounds. Migration patterns, pairing, interchange of birds from different nesting areas, measurements of morphological characters of pairs, and environmental influence on production of young are all discussed. It is proposed that the transfer of individuals between local nesting areas, coupled with selective mating and individual variation, are mechanisms which may improve the average survival of Canada geese in a variable and fluctuating environment.
393. MacInnes, C. D. 1967. Neckbanded snow, blue and Canada geese—The McConnell River project. *N. D. Outdoors* 29(9):2-6. [ONS]
394. MacInnes, C. D., R. A. Davis, R. N. Jones, B. C. Lieff, and A. J. Pakulak. 1974. Reproductive efficiency of McConnell River small Canada geese. *J. Wildl. Manage.* 38(4):686-707.

Small Canada geese (*hutchinsii-parvipes* complex of *Branta canadensis*) nesting at McConnell River, Northwest Territories, were studied intensively from 1965-71. Changes in mean clutch from year to year were due to changes in the nature of the underlying distribution, not to shifts in the mean of a common distribution. Comparison of changes in shape of clutch distributions between McConnell River and Cape Churchill, Manitoba indicated that variations occurred synchronously. Records from 58 marked females whose nests were found in two or more seasons at McConnell River yielded no significant effect of either individuals or years. Each year some adults known to have nested previously failed to nest. Minimum estimates of nonbreeding ranged from 6 to 22 percent, while maxima were from 18 to 41 percent of the potential breeding population. No renesting was observed in 10 years of study. Predation, of which about half was due to human disturbance, resulted in loss of 13-31 percent of eggs. Seven to 26 percent of eggs or young goslings disappeared between the last observations before hatching and the appearance of families on the summer feeding areas about a week after hatch. In late seasons, losses from six-egg clutches at this stage were greater than from smaller clutches. Once families reached the feeding areas, survival was high.

Dates of egg-laying were correlated with dates of disappearance of snow. Mean size of broods was negatively correlated with date of thaw, but mean clutch was not, indicating that delayed thaw adversely affected events after egg-laying. Comparison of estimates of reproductive efficiency obtained from direct observation of marked geese with statistics obtained from the whole population showed that procedures for estimating population statistics were accurate.

The data were used to provide indirect support for the hypothesis that clutch size and success at incubation were functions of stored reserves. The nesting schedule of geese was timed so that the young would develop during the period of maximum plant growth. Reproductive efficiency (not including nonbreeding) at McConnell River was as high as that reported for Canada geese on the Columbia River (Hanson and Eberhardt 1971), mean values being 60 and 57 respectively. A

C. Schoenfeld, eds. Canada goose management. Dembar Educational Research Services. Madison, Wis. 195 pp.

Preliminary report on a continuing study on the Canada geese nesting at the McConnell River, Northwest Territories. Neckband observations suggest that considerable immigration and emigration occurs between nesting concentrations.

396. MacInnes, C. D., and R. K. Misra. 1972. Predation on Canada goose nests at McConnell River, Northwest Territories. *J. Wildl. Manage.* 36(2):414-422.

Predation losses from nests of small Canada geese (*Branta canadensis*) were observed from 1965 to 1969, on a 62-square-km study area at the mouth of the McConnell River, Northwest Territories. The lack of significant regression of logarithm of clutch size at first observation on date indicated that partial loss of a clutch did not occur in the absence of disturbance by humans. Partial clutch losses comprised 55 percent of all eggs observed lost after repeated visits to individual nests. The proportion of nests completely destroyed did not vary among years, but the proportion losing some eggs did change significantly. The latter difference was due to changes in the activity of predators, or of their interaction with humans, and not due simply to changes in human activity. The number of eggs lost per visit was the same (0.65 egg per visit) for all clutch sizes except six, which lost 0.26 egg per visit. This resulted in greater total destruction of small clutches, because the eggs lost represented a higher proportion of the initial clutch. It was concluded that in the absence of human disturbance, predation losses of eggs would have been small (approximately 10 percent) and would have varied little from year to year despite demonstrated changes in predator activity. A major exception to this might occur because of a high arctic fox (*Alopex lagopus*) population, which was not observed in the course of this study. A

397. MacInnes, C. D., J. P. Prevett, and H. A. Edney. 1969. A versatile collar for individual identification of geese. *J. Wildl. Manage.* 33(2):330-335.

The construction and use of an aluminum collar colored and lettered with "Scotch Brand" plastic film tape are described. Problems were encountered when these collars were applied to blue geese (*Chen caerulescens*). Advantages and disadvantages of plastic and aluminum collars are discussed. A

395. MacInnes, C. D., and B. C. Lief. 1968. Individual behavior and composition of a local population of Canada geese. Pages 93-101 in R. L. Hine and

398. Malecki, R. A. 1976. The breeding biology of the Eastern Prairie Population of Canada geese. Ph.D. Thesis. Univ. Missouri, Columbia. 160 pp. [ONS]
399. Manny, B. A., R. G. Wetzel, and W. C. Johnson. 1974. Annual contribution of carbon, nitrogen and phosphorus by migrant Canada geese to a hard water lake. Proc. Int. Assoc. Theor. Appl. Limnology, Winnipeg, Manitoba, 19. 4 pp. (mimeo)
400. March, G. L., T. M. John, B. A. McKeown, L. Sileo, and J. C. George. 1976. The effects of lead poisoning on various plasma constituents in the Canada goose. J. Wildl. Dis. 12(1):14-19.
- Plasma glucose, free fatty acid and uric acid levels were measured in lead-poisoned Canada geese (*Branta canadensis*). Although plasma glucose levels were only slightly elevated, uric acid was significantly higher and free fatty acids were significantly lower. Altered plasma levels were attributed to increased protein catabolism and perhaps renal disfunction. Plasma level of growth hormone and prolactin was assessed by radioimmunoassay. Growth hormone remained unchanged while prolactin was unusually high. The increased prolactin levels may reflect an effort to stabilize free fatty acids. A
401. Marquardt, R. E. 1960. Smokeless powder cannon with light-weight netting for trapping geese. J. Wildl. Manage. 24(4):425-427.
- Improvements in net-trapping equipment for Canada geese are discussed.
402. Marquardt, R. E. 1961. Albinism in the small white-cheeked geese. Auk 78(1):99-100.
- Description of an immature female Canada goose, tentatively identified as *Branta canadensis hutchinsii*, as an example of incomplete albinism. The specimen was captured at the Salt Plains National Wildlife Refuge in Oklahoma in 1959.
403. Marquardt, R. E. 1962. Ecology of the migrating and wintering flocks of the small white-cheeked geese within the south central United States. Ph.D. Thesis. Oklahoma State Univ., Stillwater. 179 pp.
- Small Canada geese prefer exposed feeding, resting, and roosting places. Feeding was most often observed in fields of more than 100 acres. Small Canada geese migrate southward over two relatively distinct routes, designated tall- and short-grass prairie routes. Route names imply no ecological relations of the birds. WR
404. Marquardt, R. E. 1962. Identification of age classes of Canada geese in field flocks. J. Wildl. Manage. 26(1):96-97.
- Use of differences in breast plumage in separating immature from adult age classes in the field is discussed. With the unaided eye, this method proved accurate at distances up to 50 feet.
405. Marquardt, R. E., and C. Pribil. 1962. The *Anser leucopareius* of brandt. Proc. Okla. Acad. Sci. 42:274-279. [ONS]
406. Martin, F. R. 1955. Red fox food habits in the vicinity of a vulnerable captive goose flock. J. Wildl. Manage. 19(4):496-497.
- Description of activities of red fox in and around a 22-acre enclosure for Canada geese at the Upper Souris National Wildlife Refuge, North Dakota. No predation on the geese was recorded, although fox did hunt mice within the goose pen.
407. Martin, F. R. 1963. Colored vinylite bands for waterfowl. J. Wildl. Manage. 27(2):288-290.
- Easily attached and readily visible leg bands for Canada geese (*Branta canadensis*) were made by heat-forming 1- x 6-inch strips of colored vinylite around a slotted 3/4-inch electrical conduit, then rolling them into conformation on a steel rod of the desired diameter and sealing them with acetone. An experienced operator can fabricate 40 bands per hour. A
408. Martin, F. W. 1957. Color marking and field observation of Canada geese to determine breeding territorialism, family organization, and population dynamics. Utah Division of Wildlife Resources. 16 pp. [ONS]
409. Martin, F. W. 1958. Territorialism in Canada geese. Utah Fish Game 14(10):14-15. [ONS]
410. Martin, F. W. 1963. Behavior and survival of Canada geese in Utah. Ph.D. Thesis. Utah State Univ., Logan. 98 pp. [ONS]
411. Martinson, R. K., and J. A. McCann. 1966. Proportion of recovered goose and brant bands that are reported. J. Wildl. Manage. 30(4):856-858.

A few more than one-third of the goose and brant bands recovered by hunters were reported to the Bird Banding Laboratory (a rate of 0.361) during the 1962-64 hunting seasons. [Problems associated with band reporting rates near goose concentrations are discussed.] A

412. McCabe, T. R. 1977. Productivity and nesting habitat of Great Basin Canada geese; Umatilla National Wildlife Refuge. M.S. Thesis. Oregon State Univ., Corvallis. 85 pp. [ONS]

413. McDaniel, J. 1966. Wild goose roundup. Fla. Wildl. 20(7):20-21. [ONS]

414. McDougale, H. C., and R. W. Vaught. 1968. An epizootic of aspergillosis in Canada geese. J. Wildl. Manage. 32(2):415-417.

An epizootic in Canada geese (*Branta canadensis*) occurred at the Swan Lake National Wildlife Refuge, Chariton County, Missouri, in 1966. Approximately 2,000 geese died during the first 18 days of October. Losses were localized and did not spread to 75,000 other geese on the refuge. Respiratory distress was common among the few sick geese that were observed in the field. All except two geese examined at the laboratory had varying degrees of pulmonary aspergillosis. Three distinct phases of mycotic pneumonia were recorded. A

415. McFarland, L. Z., and H. George. 1966. Preference of selected grains by geese. J. Wildl. Manage. 30(1):9-13.

The preference of 12 livetrapped adult geese for several grains was tested over a 49-day period. [Three western Canada geese (*Branta canadensis moffitti*) and two cackling geese (*B.c. minima*) were involved. Grain consumption, preferences, and associated factors are discussed.] A

416. McKinley, D. 1961. History of the Canada goose in Missouri. Bluebird 28(3):6-12.

A synthesis of historical records of Canada geese breeding in Missouri. The native goose belonged to the large subspecies *Branta canadensis maxima*, and records go back as far as Lewis and Clark in the summer of 1804. The majority of the accounts are from the 1800's and the last breeding record mentioned is around 1920.

417. McKinley, D. 1964. Slaughter at Swan Lake. Audubon Mag. 66(3):144-145.

Swan Lake Federal Waterfowl Refuge was established in 1937. In 1955, one-tenth of the refuge was made available to the Mo. Conserv. Comm. for use as a public shooting area, and the area chosen consisted of a narrow strip around the refuge. Dead and crippled birds may not legally be retrieved if they fall within the area closed to public shooting. In a survey of about 10% of the refuge perimeter the author found 470 dead and crippled geese. "As a biologist, I visited Swan Lake to study the impact of the newly-allowed shooting season there. . . . Sometimes I wonder if it might not be better if 'game' management were forgotten altogether and a form of poultry husbandry were instituted instead." WR

418. McLandress, R. M. 1970. Observations of nesting Canada geese (*Branta canadensis maxima*) on the islands of Dog Lake, Manitoba. Can. Wildl. Serv. Unpubl. Biol. Rep. 5 pp. [ONS]

419. Merrill, J. C. 1883. Nesting habits of the Canada goose (*Bernicla canadensis*). Bull. Nuttall Ornithol. Club 8(2):124-125.

A description of the nesting locations and nest construction of Canada geese along the Upper Missouri, Yellowstone, and Big Horn rivers in Montana.

420. Mershon, W. B. 1925. Big geese. Field and Stream 34:26-27, 63-64. [ONS]

421. Mershon, W. B. 1928. Canada goose migration at Saginaw, Mich. Auk 45(1):93.

A large night migration of Canada geese over Saginaw, Michigan, is discussed.

422. Mickelson, P. G. 1975. Breeding biology of cackling geese and associated species on the Yukon-Kuskokwim Delta, Alaska. Wildl. Monogr. 45. 35 pp.

An extensive study of the breeding biology of cackling geese (*Branta canadensis minima*). An average of 204 pairs nested on the 4-square-mile study area each year. Cackling geese preferred to nest on islands. Average clutch size for successful nests was 4.3. Nesting success averaged 67.6% and brood size 3.7. During the brood season, cackling geese preferred sedge meadows for feeding and resting areas. Young geese reached flight stage in 6 to 9 weeks, and families migrated south 1 or 2 weeks after the young gained flight. Predation was the cause of 65.8% of all goose and eider egg losses. Species interrelationships are discussed.

423. Miller, A. W., and B. D. Collins. 1953. A nesting study of Canada geese on Tule Lake and Lower Klamath National Wildlife Refuges, Siskiyou County, California. *Calif. Fish Game* 39(3):385-396.
- During the spring of 1952, a nesting study of Canada geese was carried out on Tule Lake and Lower Klamath National Wildlife refuges. A sample of 201 complete nest histories was obtained. Muskrat houses (38%) and islands (36.6%) were the preferred nest sites chosen with respect to visibility, protection, proximity of other nesting geese and distance to water. Cover type appeared to be incidental to site selection. One hundred fifty-eight nests (78.6%) were successful. Desertion and flooding were the major cause of losses. Eight hundred ten eggs in successful nests produced 705 young (87%). The average clutch was 5.13 and average hatch per clutch, 4.43. Of eggs in successful nests, 1.9% were infertile and 9.4% contained dead embryos. The length of the nesting period was about 83 days, with the peak of the hatch occurring between 23 April and 12 May.
424. Miner, J. 1937. The weight of our Canada geese. *Field and Stream*. Pp. 5-6. [ONS]
425. Miner, M. F. 1931. Migration of Canada geese from the Jack Miner Sanctuary and banding operations. *Wilson Bull.* 43(1):29-34.
- An account of early recoveries of Jack Miner bands from Indians on the coast of Hudson Bay. Banding operations are discussed.
426. Moffitt, J. 1931. The status of the Canada goose in California. *Calif. Fish Game* 17(1):20-26.
- A popular account of the distribution, numbers, and life history of the Canada goose in California.
427. Moffitt, J. 1937. The white-cheeked goose in California. *Condor* 39(4):149-159.
- An account of specimen collecting and taxonomy of Canada geese in California.
428. Moffitt, J. 1939. Notes on the distribution of the lesser Canada goose and cackling goose in California. *Condor* 41(4):164-166.
429. Moffitt, J. 1939. Notes on the distribution of whistling swan and Canada goose in California. *Condor* 41(3):93-97.
- A summary of nesting locations and wintering areas for Canada geese in California.
430. Mohler, L. L. 1945. Lead poisoning of geese near Lincoln. *Nebr. Bird Rev.* 13(2):49-50. [ONS]
431. Moser, J. 1972. Breeding ecology of Canada geese. West Virginia Division of Game and Fish. 10 pp. [ONS]
432. Moser, J. D. 1973. Ecology of Canada geese at McClintic Wildlife Station. M.S. Thesis. West Virginia Univ., Morgantown. 81 pp. [ONS]
433. Munro, D. A. 1960. Factors affecting reproduction of the Canada goose (*Branta canadensis*). *Proc. Int. Ornithol. Congr.* 12:542-556.
- Discussion of the interrelationships and relative effects of some of the factors influencing the early stages of the reproductive period in certain British Columbia populations of Canada geese. The nature of the habitat and of water conditions determines losses to flooding and can result in crowding, also with resultant losses. An interspersed dense brushy cover with open feeding areas favors gosling survival. Predation has little effect on reproduction while desertion has a major effect on success. A population model based on different figures for survival and production is presented with a figure tying together population status with different environmental parameters.
434. Nagel, J. n.d. Banding the breeds. *Utah Fish Game* 19(7):20-21.
- Summary of the Utah waterfowl banding program with particular attention to local Canada goose flocks.
435. Nagel, J. E., and G. F. Wrakestraw. 1968. The impact of season limits on Great Basin goose harvests. Pages 117-121 in R. L. Hine and C. Schoenfeld, eds. *Canada goose management*. Dembar Educational Research Services. Madison, Wis. 195 pp.
- Season bag limits and other harvest restrictions in Utah, Wyoming, Montana, and Nevada implemented to reverse a decline in the Great Basin goose flock are evaluated. It was concluded that season bag limits could reduce total harvest, particularly when implemented by requiring use of a certain number of tags.
436. Nass, R. D. 1964. Sex- and age-ratio bias of cannon-netted geese. *J. Wildl. Manage.* 28(3):522-527.
- Age ratios of Canada geese (*Branta canadensis*), derived from catches in cannon traps, are of questionable value unless time on bait is

taken into account. Findings were based on examination of 2,879 geese caught in 46 timed catches at Swan Lake National Wildlife Refuge in 1961 and 1962. The proportion of adults in the catches increased with length of time on bait. No significant differences were found in sex ratios as time on bait increased. A

437. Naylor, A. E. 1953. Production of the Canada goose on Honey Lake Refuge, Lassen County, California. *Calif. Fish Game* 39(1):83-94.

The goose nesting season of 1951 was examined at Honey Lake, California. The peak of laying came between 25 March and 10 April with the peak of the hatch between 15 April and 30 April. Hardstem bulrush, islands, and ditchbanks comprised 75% of the total nest sites. A total of 360 nests produced 1,904 eggs for an average clutch size of 5.53 eggs. Of the 360 nests, 68.3% were successful. Hatching success was 82.6%. Desertion accounted for 23.9% of the unsuccessful nests and destroyed nests accounted for 7.8%. Management recommendations for increasing the goose flock were pre-season predator control, construction of islands, and control of vegetation.

438. Naylor, A. E., and E. G. Hunt. 1954. A nesting study and population survey of Canada geese on the Susan River, Lassen County, California. *Calif. Fish Game* 40(1):5-16.

A study of the Canada goose population on the Susan River and Honey Lake Refuge during the 1952 nesting season suggested that the river was primarily a nonbreeding area and secondarily a nesting area. Nesting density along the river was 3.6 nests per mile with ditchbanks being the preferred nest sites. On the Susan River, nesting success was 79.3%; at Honey Lake success was 64.9%. The population on the Susan River was estimated to be 1,100 to 1,300 during the nesting season.

439. Neff, D. J. 1957. Vanishing geese. *Colo. Outdoors* 6(6):5-8.

Colo. is in danger of losing its last major flock of breeding Canadas. Geese nesting along the Yampa and Green Rivers are in serious, rapid decline, as census figures show. Studies in 1956 revealed good reproduction success on the breeding islands. Trouble appeared to be too much shooting locally and further s. in flyway. Seasons were reduced, but decline continued in 1957. Also, in 1957, reproduction was much affected by floods. Local hunting was stopped. Improvement of breeding islands was

begun. Geese nested on ground where visibility was good. Improvements were provisions of nesting structures and clearing of vegetation. WR

440. Neilson, D. E. 1960. Study on the use of captive or pinioned Canada geese in establishing breeding populations in new areas. Utah Division of Wildlife Resources. 3 pp. [ONS]

441. Nelson, H. K. 1952. Hybridization of Canada geese with blue geese in the wild. *Auk* 69(4):425-428.

Two geese killed at the Sand Lake National Wildlife Refuge in South Dakota during the 1950 hunting season were identified as crosses between one of the small Canada geese and the blue goose. Two other oddly colored specimens were observed but not confirmed. A description of both specimens is included with a survey of other known examples of hybridization.

442. Nelson, H. K. 1962. Recent approaches to Canada goose management. U.S. Fish Wildl. Serv., Spec. Sci. Rep.—Wildl. 66. 25 pp.

The classification and ranges of the Canada geese in the management programs of the Mississippi and Central Flyways are briefly presented. Trends in the four major populations are shown by means of tables. Management procedures are outlined and a harvest quota system discussed, with modifications suggested for the eastern prairie population. Future needs in goose management are outlined. WR

443. Nelson, H. K. 1963. Restoration of breeding Canada goose flocks in the North Central States. *Trans. N. Am. Wildl. Nat. Resour. Conf.* 28:133-150.

The use of captive flocks of Canada geese to serve as decoys for migrants or to establish breeding flocks is discussed for the North Central States. The production by resident Canada goose flocks on 13 National Wildlife refuges in the North Central region during the period 1936-62 totaled 22,300, with annual production averaging 1,500 to 2,000 birds during the past 5 years. Production on the major State projects cited reached 2,600 in 1962. Collectively, State and Federal areas in the North Central States produced 4,000 to 4,500 geese annually as of 1963. Management techniques and recommendations are presented.

444. Nelson, R. C. 1976. Age determination of Canada geese (*Branta canadensis maxima*) by layers in the periosteal zone. M.S. Thesis. Ohio State Univ., Columbus. 50 pp. [ONS]
445. Nelson, U. C. 1953. Cliff-nesting Canada geese on the arctic slope of Alaska. *J. Wildl. Manage.* 17(4):536.
- An account of one nest and several individuals (*Branta canadensis leucopareia*) observed on inaccessible cliffs on the arctic coast in 1949.
446. Nelson, U. C., and H. A. Hansen. 1959. The cackling goose—its migration and management. *Trans. N. Am. Wildl. Conf.* 24:174-187.
- The breeding range and migration route of the cackling goose (*Branta canadensis minima*) are discussed. Harvest and mortality data are presented with life tables of adult and juvenile cackling geese banded on the Yukon Delta. Population estimates place the cackling goose population between 250,000 and 300,000 birds.
447. Neth, J. W., III. 1971. Identifying natal areas of Ohio-hatched Canada geese by neutron activation analysis. M.S. Thesis. Ohio State Univ., Columbus. 57 pp. [ONS]
448. Nulle, C. W. 1970. The giant Canada goose in South Dakota. *Mod. Game Breed.* 6(8):13-14, 27.
- Presents management techniques for captive breeding of giant Canada geese. Endeavors of landowner cooperator projects are reported. WR
449. Olsen, D. L. 1964. The effects of weather on harvest and movements of the Canada goose (*Branta canadensis interior*). M.S. Thesis. Southern Illinois Univ., Carbondale. 36 pp. [ONS]
450. Olson, S. T. (nd) Gull-waterfowl relationships in the Yukon-Kuskokwim Delta. Pages 53-61 in Alaska Game Commission, P-R Rep. Proj. (W)3R-6(1). [ONS]
451. Ordal, N. J. 1971. Canada goose repopulation studies, Roseau River Wildlife Management Area. Minn. Dep. Nat. Resour., Game Res. Q. Rep. 31(3):154-158. [ONS]
452. Otis, R., W. Johnson, and D. Cowan. 1975. Dominance behavior in Canada geese when population density is increased. *Am. Zool.* 15(3):820. (Abstract)
- Dominance behavior in three groups of semi-wild Canada geese (*Branta canadensis*) was measured at a food trough over a period of one year. Each group consisted of three wing-pinioned breeding pairs maintained in one of three identical fields (each 45 by 60 m). Baseline observations were made in Phase I (4 months duration). In Phase II (4 months duration), two of the groups were combined, thereby doubling the population density. The dominance hierarchy remained linear and transitive under the higher density condition but access to the food was not restricted according to dominance rank, resulting in all birds eating at the same time. In Phase III, the groups were replaced in their separate fields, causing food access to be once again ordered according to rank, as it was in Phase I, indicating that dominance hierarchies may become inefficient social-organizing forces under certain increased density conditions in geese. A
453. Pack, A. B. 1967. Spring migration of waterfowl in New York and the weather/Canada geese pick a stormy day in 1965. *Kingbird* 17(1):7-13. [ONS]
454. Page, C. A. 1958. Antibody response of the Canada goose to the Newcastle disease virus. *Avian Dis.* 2(3):365-369.
- The sera of 33 wild Canada geese were examined for SN titers to Newcastle disease. The average SN titers was 1.2 with the titers ranging from 0 to 2.5. Nineteen birds had titers greater than 1.0. When ten of the birds were exposed to Newcastle disease virus of chicken origin, no symptoms or deaths occurred. Serum titers increased from 1.2 to 4.2 logs within two weeks. By ten weeks titers virtually dropped to zero. A second virus exposure at ten weeks produced a prompt increase in average titers to 5.9 after one week. A
455. Pakulak, A. J. 1969. Nesting ecology of Canada geese of the Churchill area, northern Manitoba. M.S. Thesis. Colorado State Univ., Fort Collins. [ONS]
456. Pakulak, A. J. 1970. Little Seal River Canada goose investigation. Manitoba Dep. Mines Resources Environmental Management, Research Branch, Unpublished Biological Report. 26 pp. [ONS]
457. Palmer, S. F., and D. O. Trainer. 1969. Serologic study of some infectious diseases of Canada geese. *Bull. Wildl. Dis. Assoc.* 5:260-266.

A serologic study was conducted to investigate the exposure of captive and free-flying Canada geese (*Branta canadensis*) to five arboviruses, chlamydiae, and *Mycoplasma gallisepticum*. Of more than 1200 serums screened in the metabolic-inhibition test (MIT), no serums neutralized eastern encephalitis virus (EEV), less than 1% neutralized western (WEV), or Venezuelan (VEV) encephalitis viruses, 2% neutralized St. Louis encephalitis virus (SLEV), and 29% neutralized California encephalitis virus (CEV). Supplementary serologic procedures indicated that a nonspecific inhibitor probably caused inhibition of CEV in the MIT.

Fifty-six percent of 197 serums had hemagglutination-inhibition titers of 1:80 or higher against *M. gallisepticum* and were considered "positive." Two hundred and eight serums were negative for complement-fixing antibody against chlamydiae. A

458. Palmer, S. F., and D. O. Trainer. 1970. Serologic evidence of Newcastle disease virus in Canada geese. *Avian Dis.* 14(3):494-502.

Newcastle disease virus (NDV) hemagglutination-inhibition (HI) titers of 1:20 or higher were detected in 31% of 3,010 sera from migratory and nonmigratory Canada geese (*Branta canadensis*). HI titers ranged to 1:1280, and virus neutralization (VN) titers ranged to 106.3+. Reactor-prevalence was 1% among flightless juveniles and higher in older geese. Prevalence of NDV reactors did not differ consistently between migratory and nonmigratory Canada geese or between sexes. The correlation of NDV HI and VN titers and the predominant resistance of the Canada goose HI substance to heat-trypsin-periodate treatment suggested that a reasonable indication of previous exposure of Canada geese to NDV is an HI titer of 1:20. A probable isolation of NDV was made from the spleen of a wild Canada goose. WR

459. Patterson, I. J. 1976. The role of social behaviour in limiting the size of wildfowl populations and their output of young. *Wildfowl* 27:140-141.
460. Patterson, R. L. 1954. Restoring the Canada goose. *Wyo. Wildl.* 18(7):12-15.

A report on the status and plans of Wyoming's Canada goose restoration project.

461. Patterson, R. L., and R. M. Ballou. 1953. The status of the Canada goose in Wyoming. *Wyo. Wildl.* 17(8):4-14, 36.

The majority of Wyoming's breeding flocks were located on western slope and Great Basin drainages as of 1953. The paper deals with management directed toward improving the already established flocks and introducing resident flocks to areas recently improved for geese as a result of water development and agricultural activities.

462. Perry, R. F. 1949. Spring geese at Oak Orchard. *N.Y. State Conserv.* 3(5):16. [ONS]
463. Petschow, D., I. Wuerdinger, R. Bauman, J. Duham, G. Braunitzer, and C. Bauer. 1977. Causes of high blood oxygen affinity of animals living at high altitude. *J. Appl. Physiol.* 42(2):139-143. [ONS]
464. Phillips, J. C. 1910. Notes on the autumn migration of the Canada goose in eastern Massachusetts. *Auk* 27(3):263-271.

Arrival dates, hunting kill, flight route, direction and magnitude, weather factors, and "races" of geese are all discussed for the eastern Massachusetts migration of Canada geese in the late 1800's and early 1900's.

465. Phillips, J. C. 1911. Two unusual flights of Canada geese noted in Massachusetts during the fall of 1910. *Auk* 28(3):319-323.

An unusually early migration of Canada geese on 3 and 4 October 1910, and a very late migration on 28 November of the same year are described. The relation of these flights to weather conditions in Eastern Canada and New England is covered.

466. Phillips, J. C. 1913. A crested Canada goose. *Auk* 30(4):578.

On 15 February 1913 three Canada geese, all with a peculiar crest of feathers, were shot from the same flock of geese near Pea Island, North Carolina. Possible explanations are discussed and a sketch is included.

467. Phillips, J. C. 1916. Two problems in the migration of water fowl. *Auk* 33(1):22-27.

Geese migrate in family parties and groups of families. The usual size of a family is 6 or 7, often it is 5, and occasionally 8. A

468. Phillips, J. C. 1921. Massachusetts geese. *Auk* 38(2):271-272.

An exceptionally large fall migration was observed in Massachusetts in 1920. The goose kill

reflected this increase in numbers.

469. Phillips, J. C. 1928. Another "swoose" or swan × goose hybrid. *Auk* 45(1):39-40.
- The product of a union between a male black Australian swan (*Chenopsis atrata*) and a female Canada goose is discussed. The hybrid survived for about 1½ years. Photographs are included.
470. Pindar, L. O. 1886. The breeding of *Branta canadensis* at Reelfoot Lake, Tenn. *Auk* 3(4):481.
- An observation of breeding Canada geese on Reelfoot Lake, Tennessee, in 1886.
471. Pirnie, M. D. 1938. Restocking of the Canada goose successful in southern Michigan. *Trans. N. Am. Wildl. Conf.* 3:624-627.
- Since 1928, a captive flock of Canada geese has nested at the W. K. Kellogg Bird Sanctuary near Battle Creek. At first, the young were pinioned to add to the captive flock. Since 1931, less than two dozen of the young have been allowed to fly as they please. Since about 1930, full-winged escaped birds have been nesting in this vicinity with an annual yield of young in excess of those produced inside the sanctuary.
472. Pirnie, M. D. 1943. The W. K. Kellogg Bird Sanctuary in wildlife researches. *Mod. Game Breed.* 13(7):6, 13. [ONS]
- Account of successful colonization of Canada geese at the Kellogg Sanctuary.
473. Pirnie, M. D. 1954. The grazing of dormant winter wheat by wild geese. *Mich. Agric. Exp. Stn., Q. Bull.* 37(1):95-104.
- Quantitative study of plots in southeastern Michigan that were grazed by wild or captive geese. Geese clip and graze but seldom pull up the plants. Effects on yield, scare devices, and interactions of geese with other factors are discussed.
474. Plath, L. 1975. Noteworthy observations from the Lower Warnow River Region. *Falke* 22(4):122-123. [ONS]
475. Preston, F. W. 1953. The shapes of birds' eggs. *Auk* 70(2):160-182.
- The dimensions of Canada goose eggs from the Preston collection are included in Table 5, page 178.
476. Prevett, J. P., B. C. Loeff, and C. D. MacInnes. 1972. Nest parasitism at McConnell River, N.W.T. *Can. Field-Nat.* 86(4):369-372.
- Records of blue geese and common eiders laying in Canada goose nests and Canada geese laying in common eider and blue goose nests.
477. Prevett, J. P., and C. D. MacInnes. 1973. Observations of wild hybrids between Canada and blue geese. *Condor* 75(1):124-125.
- Detailed descriptions were recorded for 10 of 30 blue goose-Canada goose hybrids observed in the field and some features were recorded for another 10. Status and frequency of the hybrids are discussed.
478. Radesäter, T. 1974. Form and sequential associations between the triumph ceremony and other behaviour patterns in the Canada goose (*Branta canadensis* L.) *Ornis. Scand.* 5(2):87-101.
- Hostile and triumph ceremony behaviour of the Canada Goose was studied 1970-1973. Threat and triumph display postures are briefly described. The form of the triumph ceremony postures indicates that the initiating part (rolling), and probably also the terminating part (cackling) are related to agonistic behaviour patterns. The sequential organization of the patterns also reveals an association between hostile behaviour and the triumph ceremony. It is concluded that the triumph display and agonistic behaviour in this species have motivating factors, internal or external to the animal, in common. The variation in amount and proportion between the triumph display components shows that rolling prevails in pre-attack performances and when strange geese are close to the pair in the territory, while cackling prevails in post-attack performances and in displays without connection with overt hostile encounters. A
479. Radesäter, T. 1974. On the ontogeny of orienting movements in the triumph ceremony in two species of geese (*Anser anser* L. and *Branta canadensis* L.). *Behaviour* 50(1-2):1-15.
480. Radesäter, T. 1975. Biting in the triumph display of the Canada goose. *Wilson Bull.* 87(4):554-555.
- Significantly more bites were delivered when the birds were meeting frontally than when they adopted more laterally oriented positions. Male biting in the ceremony seemed to be more likely in some situations than others, obviously depending on the relative rank of the intruder

eliciting the display. It does not seem improbable that a ritualized male bite and a female appeasing signal might serve to allow expression of activated aggressive tendencies in a peaceful way when such tendencies are inhibited from a natural outlet.

481. Radesäter, T. 1975. Interactions between ♂ and ♀ during the Triumph Ceremony in the Canada Goose (*Branta canadensis* L.). *Z. Tierpsychol.* 39:189-205.

The sequential order of behaviour patterns in the Triumph ceremony of the Canada goose is described. Besides rolling and cackling—the two main displays during a ceremony—5 other patterns, or groups of patterns, occurred with enough frequency to make statistical treatment possible. In both intra- and inter-individual sequences the [behavioural] acts do not appear at random. Male attack and threat behaviour appear so frequently immediately upon female threat during the ceremony that the similarity to the inciting behaviour of ducks is striking. A

482. Radesäter, T. 1976. Individual sibling recognition in juvenile Canada geese (*Branta canadensis*). *Can. J. Zool.* 54(7):1069-1072.

Results from choice experiments indicate that a juvenile Canada gosling is able to recognize members of its own sibling group when only a few days old.

483. Raveling, D. G. 1966. Factors affecting age ratios of samples of Canada geese caught with cannon-nets. *J. Wildl. Manage.* 30(4):682-691.

Widely differing opinions are held concerning the reliability of age-ratio statistics derived from samples of Canada geese trapped with cannon-nets. The 95 percent confidence limits of an age-ratio estimate of 41.3 percent immature derived from 35 catches involving 2,451 geese were 35.3–50.5 percent immature. These data indicate the potential for error when such data are used to analyze population dynamics. Based on a study of behavior of marked Canada geese of all ages and sexes and family units, utilizing age-ratio telemetry, reasons are suggested for age-ratio fluctuations of cannon-net trap samples. Important interrelated factors causing such cannon-net trap age-ratio differences are time of year, time of day, food availability, behavior changes, length of time on bait, and weather. When these factors cause Canada geese to crowd densely onto a baited-

trap site, a higher percentage of adults would usually be obtained than when trap catches represent different levels of aggression, family defense, and less crowded conditions. Alternative explanations are offered of data that led Funk and Grieb (1965) to conclude that age ratios from baited-trap samples reliably indicate population structure—a conclusion different from that reached in this paper. A

484. Raveling, D. G. 1966. Reality of goose families and the questions of brood mixing. *Midwest Fish Wildl. Conf.* 20+ pp. (mimeo). [ONS]

485. Raveling, D. G. 1967. Sociobiology and ecology of Canada geese in winter. Ph.D. Thesis. Southern Illinois Univ., Carbondale. 263 pp.

Families remained intact all winter, forming subflocks with specific roost and feeding areas. Rank orders of large family > smaller family > pair > single adult > single immature were maintained by individual recognition, and by intensity and amount of threat display. Agonistic displays are identified and described. WR

486. Raveling, D. G. 1968. Can counts of group sizes of Canada geese reveal population structure? Pages 87-91 in R. L. Hine and C. Schoenfeld, eds. *Canada goose management*. Dembar Educational Research Services. Madison, Wis. 195 pp.

Observations of radio- and color-marked Canada geese during winter proved family unity in daily activities, but revealed that size of functional groups could not be regularly or accurately measured by counts of geese at the moment of take off or in steady flight. However, group size could be identified at the moment of landing. A

487. Raveling, D. G. 1968. Weights of *Branta canadensis interior* during winter. *J. Wildl. Manage.* 32(2):412-414.

Based on weights of *Branta canadensis interior* obtained from three sampling periods during winter 1964-65 at Crab Orchard National Wildlife Refuge, Illinois, the following results and conclusions emerged: adults expectedly lost weight in late winter; yearlings and immatures did not lose weight through the winter; geese at Crab Orchard were usually heavier and did not show as many nor as large

weight losses as reported from other southern Illinois localities, probably because of the relationships of numbers of geese and available food; Crab Orchard geese appeared to be in excellent condition throughout the winter. A

488. Raveling, D. G. 1969. Preflight and flight behavior of Canada geese. *Auk* 86(4):671-681.

Behavior associated with the coordination of flight in Canada geese was observed in a large winter flock at Crab Orchard National Wildlife Refuge, Illinois. The functions of, and responses to, head tossing are discussed with changes in vocalization and other aspects serving to coordinate flight activities.

489. Raveling, D. G. 1969. Roost sites and flight patterns of Canada geese in winter. *J. Wildl. Manage.* 33(2):319-330.

Observation of a large wintering flock of Canada geese (*Branta canadensis interior*) revealed the existence of relatively exclusive subflocks which consistently utilized specific areas for roosting and maintained recognizable patterns of flight direction. Roost and feed-field locations of radio-marked geese showed that consistent patterns were a result of habitual use of areas by families whereas single geese were more variable. Habitual patterns are apparently motivated by fear of unfamiliar situations and function to enable family members to reunite after separation occurs, to aid efficient use of food, and to minimize the amount and intensity of aggressive conflicts within a flock. Roost and flight patterns of singles varied because of their following nature and submissive rank position within the flock. It is suggested that some subflocks represent a continued association of geese from the same local nesting area rather than just local stratification after migration. Subflock formation in some cases could affect local (or even total) harvest and interpretation of banding and other sampling data in the study of goose populations. A

490. Raveling, D. G. 1969. Social classes of Canada geese in winter. *J. Wildl. Manage.* 33(2):304-318.

Seventy-seven Canada geese (*Branta canadensis interior*) were marked with transmitters, nasal disks, and dye to allow recording of their locations and observation of their behavior during winter. Marked geese included all or parts of 10 families, 2 pairs, and 35 yearlings. Behavior was not substantially affected by

marking. Families remained intact all winter and reassembled if separation occurred. Of 26 yearlings whose social status was identified, 19 were singles, 4 were members of families, 2 were a sibling pair, and 1 was paired. Two single yearlings were closely associated in locations and movements. Bonds among adult and immature survivors in families disrupted by mortality did not appear to be affected. Yearlings in families were probably more loosely attached to the parents than were immatures. A

491. Raveling, D. G. 1970. Dominance relationships and agonistic behavior of Canada geese in winter. *Behaviour* 37(3-4):291-319.

The study was conducted at Crab Orchard National Wildlife Refuge, Illinois, during the winters of 1963-64 and 1964-65. The paper reports results of victories and losses in aggressive conflict situations and describes the postures associated with those results. A discussion of the function and evolution of agonistic postures in relation to the stable, functional dominance hierarchy exhibited by Canada geese is included. Postures and different agonistic situations are discussed individually.

492. Raveling, D. G. 1970. Survival of Canada geese unaffected by withdrawing blood samples. *J. Wildl. Manage.* 34(4): 941-943.

Approximately 3 cc of blood were removed from each of 20 adult and 83 young (approximately 7 weeks old) Canada geese. These bled geese, as well as 43 unbled adults and 218 unbled goslings, were marked with individually identifiable plastic neckbands. Observations between 2 and 5 weeks after capture and bleeding revealed that survival was not affected by taking blood samples.

493. Raveling, D. G. 1976. Migration reversal: A regular phenomenon of Canada geese. *Science* 193(4248):153-154.

Documentation and discussion of 28 cases of reverse migration of Canada geese from their Manitoba nesting ground to wintering areas in Minnesota and back again during the same autumn. Geese were marked with individually coded neck collars.

494. Raveling, D. G. 1976. Status of giant Canada geese nesting in southeast Manitoba. *J. Wildl. Manage.* 40(2):214-226.

Surveys and banding between 1967 and 1970 delineated most of the nesting range of the

giant Canada goose (*Branta canadensis maxima*) in Manitoba, which is occupied by three population segments with different migration routes. Canada geese nesting southeast, and perhaps east, of Lake Winnipeg occupy a small range of marginal habitat and number about 3,000 to 4,000. About one-third of this total congregates at the Alf Hole Sanctuary in autumn. The population during the study was relatively stable with indications of limitation because of delayed breeding and not because of mortality. Recaptures (88) demonstrated a high fidelity of adults to their breeding area and a delayed entry of birds of potential nesting age into the banding site nesting population. Lowered body weights were associated with poor reproductive success in 1 year. Distribution of band recoveries revealed a strong association with the Rock Prairie of southeast Wisconsin, and some geese were recovered in southern Illinois and vicinity. Southeast Manitoba and southeast Wisconsin together accounted for 69 and 82 percent of 58 direct and 85 indirect band recoveries, respectively, the majority being taken in Wisconsin. Yearling geese were recovered in a wider distribution than adults or immatures. A higher proportion of geese banded in autumn was directly recovered outside the main Manitoba-Wisconsin recovery area as compared to geese banded as flightless birds in July, indicating that a segment of the population has a migration path bypassing the main Wisconsin wintering area. Immatures were 1.56 times more likely to be shot than adults, but vulnerability did not vary by geographic area. A

495. Raveling, D. G. 1977. Canada geese of the Churchill River Basin in north-central Manitoba. *J. Wildl. Manage.* 41(1):35-47.

Nesting and molting Canada geese (*Branta canadensis*) were studied along and near the Churchill River, Manitoba, between Southern Indian Lake and the Hudson Bay Lowlands in 1969 and 1970. This was west of the known major breeding range of *B. c. interior* and may be altered by hydroelectric developments. Geese were continuously distributed on backwater lakes and on ponds in drainage systems directly connected to the river. Their distribution was contiguous with geese in the Hudson Bay Lowlands, and they were morphologically indistinguishable from *B. c. interior*. Band recoveries indicated that the study area lay in a zone of transition between geese migrating to Missouri from the Lowlands and geese mi-

grating through the Central Flyway. Geese from the Churchill River, especially west of Fidler Lake (96° 52' W longitude) contribute a relatively small number of birds compared to production in the Lowlands, but there is likely a significant portion of large Canada geese using the eastern Central Flyway. Nesting was on low profile sedge-willow (*Carex-Salix*) islands on the river and on marsh and fen bordered ponds on creek drainages. Densities of geese diminished rapidly away from the Churchill River. Brood rearing habitat was sparse and limited mainly to sedge growth along shorelines and backwater bays. A

496. Raveling, D. G., W. E. Crews, and W. D. Klimstra. 1972. Activity patterns of Canada geese during winter. *Wilson Bull.* 84(3):278-295.

Based on daily observation of the activities of a large wintering flock of Canada Geese and specific records of radio-marked families and individuals, the times and nature of flight patterns of these geese are described along with the environmental variables associated with these patterns. Characteristics of flight patterns were: regularity of onset of morning and evening flights in relation to light intensity under similar weather conditions; regularity of onset of the heavy flight with respect to the first geese which flew and the prevailing light levels, usually at or just after sunrise in the mornings and between sunset and civil twilight in the evenings; variability of individuals and families within the regularity exhibited by the flock as a whole; delay of flight under completely cloudy conditions; longer periods of time spent in feeding areas when cloudy, but not when cold provided it was not too cold to prevent flight; considerable delay in flight time or usually cessation of flight when below 15° F. The motivation and probable adaptive nature of goose responses to roosting on or near water during clear weather or in fields during stormy weather and their cessation of activity in cold periods are discussed. A

497. Reed, A. 1976. Geese, nutrition and farmland. *Wildfowl* 27:153-156. [ONS]
498. Reeves, H. M., F. G. Cooch, and R. E. Munro. 1976. Monitoring arctic habitat and goose production by satellite imagery. *J. Wildl. Manage.* 40(3):532-541.

Spacecraft imagery is being used to evaluate snow and ice conditions encountered by arctic nesting geese to recognize years of catastrophic or very good production. Management

use in the setting of regulations and detailed techniques are discussed.

499. Reeves, H. M., H. H. Dill, and A. S. Hawkins. 1968. A case study in Canada goose management: The Mississippi Valley Population. Pages 150-165 in R. L. Hine and C. Schoenfeld, eds. Canada goose management. Dembar Educational Research Services. Madison, Wis. 195 pp.

A case study of the Mississippi Valley Population of Canada geese traced from market hunting in the late 1800's through refuge development and protection in Illinois in the 1930's and 1940's to quota and tagging systems implemented in Wisconsin and Illinois in the 1960's. Population data, behavioral changes, and a review of the 1966 hazing program at Horicon National Wildlife Refuge are discussed.

500. Reneau, W. J., and W. Rudersdorf. 1976. The sex, age and weight structure of the Canada goose flock of Ballard County, Kentucky, USA. *Trans. Ky. Acad. Sci.* 37(3-4):91-93.
501. Reynolds, W. A., and G. Gavutis, Jr. 1974. Starvation in a group of Canada geese. *Avian Dis.* 18(1):149-150. [ONS]
502. Richmond, M. L. 1972. Duped by a raven. *Colo. Field Ornithol.* 12:15. [ONS]
503. Rienecker, W. C. 1971. Canada goose nest platforms. *Calif. Fish Game* 57(2):113-123.

Six different designs of Canada goose (*Branta canadensis*) artificial nest platforms were tested on the Honey Lake Wildlife Area, Lassen County, California, during 1966-1970. The split drum platform design is the most promising of those tested for acceptance by the geese, low cost, stability, hauling and assembly in the field. Size and location of the platform are the main factors which determine whether a platform will be utilized or ignored. All of the large platform designs are readily accepted as nesting sites if they are located in areas favored by the geese. High winds, wave action and shifting ice are the major causes of platform damage. Platform use increased from 15% at the end of the first year of the study to 35% the second year, 44% the third year and 53% the fourth year. This increasing annual use of artificial nest platforms seems to be a normal process of learning by Canada geese. During this study period 104 goose nests were

built on test platforms. Of these nests, 102 (98%) had hatched eggs and 2 (2%) were deserted. A

504. Rienecker, W. C., and W. Anderson. 1960. A waterfowl nesting study on Tule Lake and Lower Klamath National Wildlife Refuges, 1957. *Calif. Fish Game* 46(4):481-506.

Duck, coot, and Canada goose nesting were examined during the 1957 season. Hatching success for geese was 78.7%, with 12.7% of the nests deserted, 7.1% destroyed, and 1.5% flooded. The average number hatched was 4.8. The nesting period lasted approximately 79 days, with the peak of the hatch from 22 April to 2 May.

505. Robards, F. C. 1960. Construction and operation of a portable goose trap. *J. Wildl. Manage.* 24(3):329-331.

Trap design, construction, technique, and success are all discussed for a portable drive trap utilized at Glacier Bay, Alaska.

506. Robbins, R. L. 1957. Trends in goose kill and species composition on private hunting area in 1955. South Dakota Department of Game Fish and Parks. P-R Rep. Proj. W-17-R-11. 9 pp.

One of a series of South Dakota reports on the goose kill in the Sand Lake Refuge and Fort Randall Reservoir areas.

507. Rudersdorf, W. J. 1962. Canada goose investigations in the vicinity of the W. K. Kellogg Bird Sanctuary, Kalamazoo County, Michigan. Ph.D. Thesis. Michigan State Univ., East Lansing. 208 pp.

Northward migration was from late March to mid-April when local birds were incubating. Band recoveries from the James Bay area were chiefly from the western shore. A larger proportion of the banded birds wintered on the Atlantic Coast in the period 1954-58 than in the period 1949-53. Data from a 3-year study indicated no difference in vulnerability between adults and juveniles. Sixty-eight pairs of geese raised 74 goslings to the first hunting season. Mortality rate of goslings was 63.4% until fall migration. A 50:50 sex ratio was observed. Blood parasites found were *Leucocytozoon*, *Microfilaria* and *Haemoproteus*. Ectoparasites collected were *Ornitholobius*, *Trinoton*, *Menopon*, and *Anatacola*. The average hunter spent \$74.64 per season on goose hunting, each goose cost \$49.42, hunters spent

40.5 hours per season, and 24 shells were fired for each bird bagged. Most farmers believed that Canada geese caused no crop damage. WR

508. Rutherford, W. H. 1963. Evaluation of the effectiveness of artificial nesting structures for Canada geese on Colorado breeding grounds. Cent. Mt. Plains Sect. Wildl. Soc. Conf. 8. 5 pp. [ONS]
509. Rutherford, W. H. 1965. Description of Canada goose populations common to the Central Flyway. Central Flyway Waterfowl Council Technical Committee Report. 20 pp. (mimeo) [ONS]
510. Rutherford, W. H. 1965. The Canada geese of Larimer County. Colo. Outdoors 14(2):16-19. [ONS]
511. Rutherford, W. H. 1967. Arkansas Valley goose flock management studies. Pages 61-73 in Colorado Game Fish Parks Department, Game Research Report, 1967. [ONS]
512. Rutherford, W. H. 1968. Arkansas Valley goose flock management studies. Pages 77-97 in Colorado Game Fish Parks Department, Game Research Report, 1968. [ONS]
513. Rutherford, W. H. 1968. Differential mortality of juvenile Canada geese in the Arkansas Valley of Colorado. Proc. Annu. Conf. West. Assoc. State Game Fish Comm. 48:288-293.
- There was no difference between subsequent adult and juvenile mortality rates for post-season bandings. For pre-season bandings, calculated first year mortality rates were 53% for juveniles and 36% for adults. Incidence of body shot by age class and the relationships of juvenile vulnerability to firing line versus field hunting are discussed.
514. Rutherford, W. H. 1970. The Canada geese of southeastern Colorado. Colo. Div. Game Fish Parks Tech. Publ. 26. 65 pp.
- A synthesis of current knowledge concerning the portion of the Shortgrass Prairie Canada goose population wintering in southeastern Colorado, currently numbering over 100,000 birds. Included are descriptions of the Arkansas River wintering area and the Shortgrass Prairie Canada goose population in general, the ecology of Colorado's wintering population, trapping, banding and band recovery analysis, hunting pressure analysis, as well as a management discussion. The Arkansas River

Valley flock, as it is known, has shown steady and uninterrupted growth since the late 1940's.

515. Salter, R. L. 1956. Canada goose nesting studies in Idaho. Proc. Annu. Conf. West. Assoc. Game Fish Comm. 36:191-194.
- How production is determined, how large production has been on 7 areas (1952-56), and how difficult it is at present to correlate aerial survey data with numbers of nests and production. Local studies of this type are important because they show what populations need more protection and how populations are responding to changes of regulations. Examples are given. WR
516. Salter, R. L. 1958. Canada goose nesting studies in Idaho. Idaho Wildl. Rev. 10(6):7-9.
- Nesting studies were conducted in 1952-58 on six management units in Idaho. Each area was checked in the same fashion each year. Number of nests, number of successful nests, average hatch, estimated production, and management implications are discussed.
517. Salyer, J. C. 1953. Management of captive Canada goose flocks. U.S. Fish Wildl. Serv., Wild. Manage. Series II. 11 pp. [ONS]
518. Samson, F. B. 1971. Migration of resident and migrant Canada geese banded at Necedah National Wildlife Refuge. Bird-Banding 42(2):115-118.
- An analysis of band returns of geese banded at Necedah National Wildlife Refuge indicated a distinct migration route for the resident flock different from the migrant geese. A similarity exists in migration direction between the Necedah flock and the Great Basin Bear River geese from which the Necedah flock was obtained. The use of celestial cues could explain this. A
519. Saul, R. 1970. Measure [of] the influence of artificial nesting platforms and tubs on Canada goose nesting activity and success. Wyoming Game and Fish Commission. 21 pp. [ONS]
520. Schettler, C. H. 1971. Goose virus hepatitis in the Canada goose and snow goose. J. Wildl. Dis. 7(3):147-148.
- Seven Canada goose goslings and one snow goose gosling died suddenly and were presented for diagnosis. Gross and microscopic lesions of hepatitis were observed in all birds.

A virus was isolated in embryonated goose eggs which, on the basis of complement fixation and immunofluorescence tests, was identified as goose hepatitis virus.

521. Schiller, E. L. 1954. Studies of the helminth fauna of Alaska. XVIII. Cestode parasites in young anseriforms on the Yukon Delta nesting grounds. *Trans. Am. Microsc. Soc.* 73(2):194-201.

A description of cestodes of the genus *Hymenolepis* taken from 27 cackling geese (*Branta canadensis minima*).

522. Schoonover, L. J., and H. M. Reeves. 1966. Geese—more or less? *N. D. Outdoors* 29(3):6-8. [ONS]

523. Schroeder, C. H. 1961. Homeward bound. *N. D. Outdoors* 23(10):4-7. [ONS]

524. Schroeder, C. 1967. Why only one Canada goose? *N. D. Outdoors* 30(5):1-2. [ONS]

525. Scott, R. E. 1968. Canada Goose taking over and hatching Mallard's eggs. *British Birds* 61(11):526.

A female goose, building a nest five yards from a mallard nest, took over the mallard nest with an incomplete clutch of six eggs, drove off the female mallard, and hatched four of the eggs. The ducklings died from unknown causes.

526. Shanks, C. E. 1952. Ecological study of Canada geese. Missouri Conservation Commission, 11 pp. [ONS]

527. Shaver, R. A. 1967. Land use for the wild goose. *Pa. Game News* 38(1):7-13.

A general discussion of land use and management practices as related to producing or maintaining nesting, brood, and migration habitat for Canada geese. The ecology of Canada geese is included to illustrate the basic needs of the birds.

528. Sheldon, M. G. 1957. A new nest for honkers. *Colo. Outdoors* 6(6):26-27.

Colorado's nesting platforms for Canada geese are supported by steel fence posts and topped with bales of straw. These platforms are expected to help with problems of flooding and nest predation. WR

529. Sheldon, M. G. 1959. Investigation of the Arkan-

sas Valley wintering goose flock. Pages 51-66 in Colorado Game Fish Dep. Fed. Aid Quarterly Rep., 1959. [ONS]

530. Sheldon, M. G., and J. R. Grieb. 1961. Investigation of the Arkansas Valley wintering goose flock. Pages 25-36 in Colorado Game Fish Dep. Fed. Aid Quarterly Rep., 1961. [ONS]

531. Sherwood, G. A. 1965. Recent modifications in banding equipment for Canada geese. *J. Wildl. Manage.* 29(3):640-643.

Specialized banding equipment for Canada geese (*Branta canadensis*) was constructed and used at the Seney National Wildlife Refuge. The equipment included holding cages, a revolving banding table with band-dispensing turret and holding funnels, and a weighing tripod. Use of the equipment significantly reduced handling and injury to the geese. [Construction directions are included.] A

532. Sherwood, G. A. 1966. Flexible plastic collars compared to nasal discs for marking geese. *J. Wildl. Manage.* 30(4):853-855.

Construction of a flexible plastic collar for marking geese is described. The usefulness of the collars, tried on 468 Canada geese (*Branta canadensis*) at the Seney National Wildlife Refuge from 1963 to 1965, was compared with that of nasal discs attached to 361 Canada geese at Seney in 1961 and 1962. The collars were superior to the discs in visibility, retention, and ease of placement, and injury to the geese was eliminated. There was no evidence that the collars affected breeding behavior. A

533. Sherwood, G. A. 1967. Behavior of family groups of Canada geese. *Trans. N. Am. Wildl. Nat. Resour. Conf.* 32:340-355.

Behavior relative to pair bonds and family relationships in a wild population of Canada geese (*Branta canadensis maxima*) were studied at the Seney National Wildlife Refuge in Michigan's Upper Peninsula from June 1962 to August 1965. Numbered plastic collars were placed on 468 geese, largely family groups. Findings were based on observations of geese so marked.

It was found that; (1) a productive pair bond could be developed in a matter of hours in older, acquainted geese; (2) pair bonds were permanent so long as both members remained alive; (3) pairing took place on the nesting grounds; (4) ganders raised the brood alone fol-

lowing death of the goose; (5) yearlings frequently returned to the nesting grounds with their parents; (6) yearlings often rejoined their parents after the nesting season; (7) brood mates retained strong ties well into the second year; (8) about 75 percent of the two-year-old females nested and contributed about 33 percent of the hatch; (9) 2-year-old females attempted to nest close to their natal home; and (10) brood mixing occurred and 2-year-old females were most vulnerable in losing their goslings to older, aggressive pairs.

Family groups of Canada geese contained from two to 21 members. The composition of such groups was influenced by mortality, brood mixing, yearlings rejoining parents and unions of two families. These assemblages represent a potential source of bias in determining productivity in Canada geese by fall counts of family groups. Such biases cannot be overcome by "average group count" methods currently in use. A

534. Sherwood, G. A. 1966. Canada geese of the Seney National Wildlife Refuge. Ph.D. Thesis. Utah State Univ., Logan. 321 pp.

Some significant findings, based on observations of marked geese were as follows: (1) Pairing, copulation, nest site selection, and defense of territory did not necessarily constitute positive evidence of a nesting attempt. (2) Family ties were extremely fragile the first three or four weeks of the goslings' lives, and a brood unit could be shattered at the slightest extraordinary event. (3) The intolerance of breeding pairs to other pairs during the nesting period placed an upper limit on nesting density. (4) A productive pair bond was established in a matter of hours in a pair of older geese that had lost their respective mates. (5) Pair bonds became a life-time pact so long as both members remained alive. (6) Ganders were capable of raising their brood alone when the goose died. (7) Brood mixing was common. The largest mixed brood contained 23 goslings, 21 of which were raised to flight by the adult pair. (8) About 75 percent of two-year-old females nested. They contributed about 25 percent of the total 1965 hatch. (9) Following the molt, many yearlings rejoined their parents and new brood and apparently all members migrated as a unit. Management recommendations were presented. WR

535. Sherwood, G. A. 1968. Factors limiting production and expansion of local populations of

Canada geese. Pages 73-85 in R. L. Hine and C. Schoenfeld, eds. Canada goose management. Dembar Educational Research Services. Madison, Wis. 195 pp.

Major factors limiting production and expansion of a wild flock of Canada geese at Seney National Wildlife Refuge included predation, disease, and hunting mortality. Predators, principally coyotes and raccoons, destroyed 194 nests and 874 eggs during the 1963 to 1965 breeding seasons. They also killed a minimum of 12 adults and 175 goslings. Disease, probably *Leucocytozoon*, claimed 500 goslings in 1964. Habitat improvement efforts are discussed.

536. Sickles, R. 1963. What happened at Pymatuning? Pa. Game News 34(3):18-23.

A report on the first season of controlled waterfowl hunting in 1962 at Pennsylvania's Pymatuning Goose Management Area. Procedures for controlling use of State blinds and hunter success are discussed.

537. Sickles, R. M. 1964. Pymatuning wrap-up/1963. Pa. Game News 35(3):12-15.

Despite a 2 weeks' hunting ban because of fire hazard, more waterfowl were bagged in 1963 at the Pymatuning Goose Management Area than were bagged in 1962. A harvest of 1383 geese was made by 3002 hunters in 1963. WR

538. Sileo, L., R. N. Jones, and R. C. Hatch. 1973. The effect of ingested lead shot on the electrocardiogram of Canada geese. Avian Dis. 17(2):308-313.

Myocardial degeneration and necrosis is a common finding in lead-poisoned waterfowl. An attempt was made to detect this damage electrocardiographically. The lead-II electrocardiograms of six Canada geese were recorded daily for 2 weeks before five of the birds were dosed with lead shot via stomach tube. The ECG's were recorded daily until the poisoned birds died. Myocardial necrosis was demonstrated histologically in three of the geese. The ECG's of two of these geese contained abnormalities consisting of increased R-wave amplitude, changes in ST-segment elevation and shape, and T-wave inversion. A

539. Simmons, K. E. L. 1965. Bathing behaviour of Canada geese. British Birds 58(2):58-60.

Somersaulting is described as a component

- of bathing behavior. It is postulated that somersaulting increases the wetting effect in water-bathing. WR
540. Skinner, R. W. 1963. Albinism in a Canada goose. *Auk* 80(3):366.
- A female Canada goose taken in Jackson County, Alabama, in 1958 is reported as an example of imperfect albinism. Measurements and a description of the plumage are included.
541. Smith, D. 1960. Canada geese, prize of the wetlands. *Utah Fish Game* 16(11):20-21. [ONS]
542. Smith, H. J. 1970. Chigger infestation in a Canada goose. *Can. J. Comp. Med.* 34(3):277. [ONS]
543. Smith, J. D., and F. H. Davis. 1958. Canada geese of the Mississippi Flyway. *Naturalist* 9(1):13-17.
- A general description of history and development of the Mississippi Flyway Canada goose population.
544. Speller, S. W. 1969. Arctic fox attacks on molting Canada Geese. *Can. Field-Nat.* 83(1):62.
- Two records of arctic fox attacks on Canada geese are discussed.
545. Spencer, D. L., U. C. Nelson, and W. A. Elkins. 1951. America's greatest goose-brant nesting area. *Trans. N. Am. Wildl. Conf.* 16:290-295.
- The Yukon-Kuskokwim Delta region is discussed as a waterfowl nesting area. Some band recoveries and weight data are presented for the cackling Canada goose.
546. Staebler, A. E. 1959. Subspecies of the Canada Goose in Michigan. *Wilson Bull.* 71(4):344-347.
- From examination of migrant Canada geese and specimens at the University of Michigan Museum of Zoology, the following subspecies were identified as having been recorded in Michigan: *Branta canadensis interior*, *B. c. moffitti*, *B. c. parvipes*, *B. c. taverneri*, *B. c. hutchinsii*, and *B. c. canadensis*.
547. Starky, E. E. 1972. A case of interspecific homosexuality in geese. *Auk* 89(2):456-457.
- A pair bond was formed between a male Canada goose and a male snow goose.
548. Steel, P. E., P. D. Dalke, and E. G. Bizeau. 1957. Canada goose production at Gray's Lake, Idaho, 1949-1951. *J. Wildl. Manage.* 21(1):38-41.
- On a 22,000-acre lake in southeastern Idaho, Canada geese commence nesting activities before the marsh is free of ice and snow. The peak of nesting was a week earlier in 1951 than in 1950. Seventy-seven per cent of all goose nests were located on muskrat houses; four-fifths were built in cattail, bulrush, or a combination of these two major cover types. The degree of success for 361 goose nests was 80 per cent. Land nests and marsh nests were equally successful. Fifteen per cent of all terminated nests were deserted for unknown causes. The average clutch size for the three-year study was 5.2. Following spring censuses of about 800 and 1,000 breeding and nonbreeding geese in two different years, the calculated hatch amounted to 990 and 1,010 goslings. A
549. Steenis, J. H. 1952. Plastic neck bands on Canada geese. *Eastern Bird Banding Assoc. News* 15:4-5. [ONS]
550. Stephenson, J. D., and G. Smart. 1972. Egg measurements for three endangered species. *Auk* 89(1):191-192.
- Egg measurements for the Aleutian Canada goose (*Branta canadensis leucopareia*) are presented.
551. Sterling, R. T. 1963. Wascana goose summers on the Arctic Prairies. *Blue Jay* 21:134-135. [ONS]
552. Sterling, T., and A. Dzubin. 1967. Canada goose molt migrations to the Northwest Territories. *Trans. N. Am. Wildl. Nat. Resour. Conf.* 32:355-373.
- Molt migrations of large-type Canada geese, from their midcontinent breeding ranges to the subarctic tundras of the Northwest Territories, primarily along the Thelon-Back River basins, are documented. The major molting grounds were previously covered by post-glacial lacustrine inundation. Most geese are found molting between 15 June and 30 July and the estimated summer molting population may approach 30,000 Canada geese, in an area between 60°N to 66°N and 96°W to 106°W. The summer movement northward is restricted to portions of the subadult, nonbreeding and unsuccessful breeding components of various Mississippi and Central Flyway populations of *B. c. maxima*, *B. c. moffitti* and more rarely *B. c. interior*. Records of similar migrations for other races and populations are presented. Popu-

lation segments use the same sites annually but in varying numbers. Molt migrations to isolated tundra areas are believed to have some survival value during this period of increased vulnerability. Some of the management and research implications that the phenomena presents are discussed. These are concerned with differential mortality rates, need for sanctuaries, significance of summer population mixing and potential supplementary aids to productivity measurement. A

553. Streckfuss, J. 1967. Prefab goose homes. S. D. Conserv. Dig. 34(3):17-18. [ONS]

554. Sturdy, J. C. 1972. Production of forage and its utilization by Canada geese at the Salt Plains National Wildlife Refuge. M.S. Thesis. Oklahoma State Univ., Stillwater. 67 pp. [ONS]

555. Sturm, H., and J. Fischer. 1973. The Canadian goose *Branta canadensis* at the Unstrut River. Beitr. Vogelkd. 19(1):77-78. [ONS]

556. Surrendi, D. C. 1970. The mortality, behavior, and homing of transplanted juvenile Canada geese. J. Wildl. Manage. 34(4):719-733.

During the summers of 1967 and 1968, 273 flightless 7- and 8-week-old Canada geese (*Branta canadensis maxima*) were transplanted about 100 miles from their natal lakes near Brooks, to release sites northeast of Hanna, Alberta. All transplants received leg bands and colored neck collars for field identification. A preflight mortality of 4 percent was calculated. Postflight locations, identity, and behavior of transplants were recorded. Feeding was the major daily preflight activity of transplants, and occurred most intensively at sunrise and sunset. Resident geese were dominant over transplants. Non-breeding resident geese were more tolerant of transplants than were breeding pairs. The postflight movements of transplants were localized and as a unit under the leadership of resident birds. Transplants on release sites unoccupied by resident geese dispersed from these lakes in small groups immediately after attaining flight. From 68 birds of each sex (136) transplanted in 1967, 13 homing female yearlings were recorded in the spring of 1968. In the spring of 1969, 22 females and 22 males were observed on the area from a potential of 64 males and 73 females transplanted the previous summer. Homing of yearling females was significantly ($P < 0.05$) higher than for yearling males. Eighty-five and 86

percent of the initial sightings of yearling females in 1968 and 1969 respectively, were on or within 1 mile of their release sites. In 1969, 32 percent of the initial sightings of yearling males were on or within 1 mile of their release sites. Eighty percent of the homing yearling females formed pair relationships during 1968 and 1969, with 68 percent occurring on the study area. Females appeared attracted to their release sites whether they were paired or unpaired. Sixty-eight percent of the yearling males showed pairing tendencies in 1969. Twenty-seven percent of these pair associations occurred on the study area. Of the yearling males returning, only those forming pair associations remained on the study area for 30 days or longer. Apparently the males were more attracted to the females in the pair associations than to their release sites. The pair bonds of some of the yearling females appeared to become unstable just prior to the summer molt migration. No 2-year-old males were known to home to the area. Five 2-year-old females homed to and paired on their release sites. One 2-year-old female nested and successfully raised a brood of 5 goslings. A

557. Sutton, G. M. 1927. Cackling Goose (*Branta canadensis minima*) in southeastern Michigan. Auk 44(4):559.

A small Canada goose shot in the winter of 1925-26 in Monroe County, Michigan, is described.

558. Swarth, H. S. 1913. A study of a collection of geese of the *Branta canadensis* group from the San Joaquin Valley, California. Univ. Calif. Publ. Zool. 12(1):1-24. [ONS]

559. Swarth, H. S. 1920. The subspecies of *Branta canadensis* (Linnaeus). Auk 37(2):268-272.

Mr. Swarth's paper is a response to a paper titled "The Status of the Subspecific Races of *Branta canadensis*," by Mr. J. D. Figgins in the January 1920 issue of *The Auk* (pp. 94-102). Mr. Swarth takes issue with the wording of Mr. Figgins' paper, feeling that he was misquoted and misinterpreted. No new information is presented.

560. Szymczak, M. R. 1967. Breeding biology of Canada geese of the Metro-Denver area. M.S. Thesis. Colorado State Univ., Fort Collins. 83 pp. [ONS]

561. Szymczak, M. R. 1971. Studies of Canada goose populations in Colorado transplant areas. Pages 165-189 in Colorado Game Fish and Parks Department, Federal Aid Game Research Report. [ONS]
562. Szymczak, M. R. 1972. Studies of Canada goose populations in Colorado transplant areas. Pages 77-103 in Colorado Game Fish and Parks Department, Federal Aid Game Research Report. [ONS]
563. Szymczak, M. R. 1973. Experimental studies on improving the status of Canada goose populations. Pages 33-42 in Colorado Game Fish and Parks Department, Federal Aid Game Research Report. [ONS]
564. Szymczak, M. R. 1973. Nonhunting mortality investigations of Canada geese in southeastern Colorado. Pages 77-82 in Colorado Game Fish and Parks Department, Federal Aid Game Research Report. [ONS]
565. Szymczak, M. R. 1973. Studies of Canada goose populations in Colorado transplant areas. Pages 53-75 in Colorado Game Fish and Parks Department, Federal Aid Game Research Report. [ONS]
566. Szymczak, M. R. 1975. Canada goose restoration along the foothills of Colorado. Colo. Dep. Nat. Resour. Wildl. Div. Tech. Publ. 31. 65 pp.
567. Tangen, H. I. L. 1974. Introductions of Canada geese in Norway. *Fauna* 27(3):166-176. [ONS]
568. Tarshis, I. B. 1971. An unusual fatality of a yearling Canada goose. *Jack Pine Warbler* 49(4):128.
- A mass of vegetation entangled on fishing line suffocated a yearling Canada goose when it lodged in the bird's throat.
569. Tarshis, I. B., and C. M. Herman. 1965. Is *Cnephia evenusta* (Walker) a possible important vector of *Leucocytozoon* in Canada geese? *Bull. Wildl. Dis. Assoc.* 1:10-11. [ONS]
570. Tautin, J., and J. B. Low. 1975. Harvest trends of Canada geese in Utah. *Trans. N. Am. Wildl. Nat. Resour. Conf.* 40:334-345.

Despite the declining proportion of Utah birds in Utah's harvest, both State and Federal estimates indicate total annual harvests have not decreased. It may be that the total annual harvest in Utah is being sustained by an in-

creased take of geese from elsewhere in the Intermountain West. It is unlikely that the harvest is being sustained by an increasing population, for flyway-wide winter inventories do not reflect any increase in the Great Basin Canada geese (Jensen 1973). [Survival rates calculated from band recoveries and production of young on Utah refuges are discussed.] A

571. Taverner, P. A. 1922. Adventures with the Canada Goose. *Can. Field-Nat.* 36(5):81-83.

572. Taverner, P. A. 1929. A study of *Branta canadensis* (Linnaeus) the Canada goose. Pages 29-40 in Annual Report, National Museum of Canada, 1929.

The subspecific differences and nomenclature of Canada geese are discussed as of 1929. Plumage, distribution, and morphological characters are included. The classification as given is: *Branta canadensis* (Linnaeus), the Canada goose; *B.c. canadensis* (Linnaeus), the honker or eastern Canada goose; *B.c. occidentalis* (Baird), the western Canada goose; *B.c. leucopaeria* (Brandt), the lesser Canada goose; *Branta minima* (Ridgway), the cackling goose; *Branta hutchinsii* (Richardson), Richardson's goose.

573. Taylor, W. H. 1957. Utilization, preference, and nutritional value of winter-green agricultural crops for goose food. M.S. Thesis. Virginia Polytechnic Institute, Blacksburg. 102 pp. [ONS]

574. Thomas, V. G., and J. C. George. 1975. Plasma and depot fat fatty-acids in Canada geese in relation to diet, migration and reproduction. *Physiol. Zool.* 48(2):157-167.

Adult male and female Canada geese of the Eastern Prairie Population were collected at the premigrant, postmigrant, and post-reproductive stage of the life cycle. Adipose tissue, blood, ingesta, and eggs were taken, and the fatty acid composition of the lipid fractions determined. Differences in fatty acid composition between male and female geese were not significant at the premigrant and postmigrant stages, but significant differences in the levels of 18 carbon fatty acids and arachidonic acid occurred between male and female post-reproductive geese. The fatty acid composition of pre- and postmigrant geese lipids was similar. Differences between the lipid composition of post-migrant and post-reproductive geese are attributed to the fatty

acid composition of ingested food. Variations in lipid composition between male and female post-reproductive geese could be tentatively explained by suggesting that females synthesize oleic acid de novo and divert linoleic and arachidonic acids into egg yolk lipids. Canada geese can be considered similar to other wild birds studied to date in that the composition of the depot lipids may be influenced by that of the diet, but physiological processes which place heavy demands upon fat reserves may also modify lipid composition. A

575. Timm, D. E., and R. G. Bromley. 1976. Driving Canada geese by helicopter. *Wildl. Soc. Bull.* 4(4):180-181.

Documentation of capture technique involving helicopter-driving of flightless Canada geese into a corral trap, including cost analysis.

576. Todd, W. E. C. 1938. A new eastern race of the Canada Goose. *Auk* 55(4):661-662.

The taxonomy of specimens of Canada geese collected in eastern Canada as far west as the east coast of Hudson and James bays is discussed. A distinction between *Branta canadensis canadensis* and *B. c. interior* is attempted.

577. Trainer, C. E. 1959. The 1959 western Canada goose (*Branta canadensis occidentalis*) study of the Copper River Delta, Alaska. U.S. Bur. Sport Fish. Wildl. Annual Waterfowl Report, Alaska. (mimeo)[ONS]

578. Trainer, D. O., and R. A. Hunt. 1965. Lead poisoning of waterfowl in Wisconsin. *J. Wildl. Manage.* 29(1):95-103.

The presence, prevalence, and significance of lead poisoning as a mortality factor of wild waterfowl in Wisconsin is reviewed. Since 1940, more than 1,700 Canada geese (*Branta canadensis*) have succumbed to lead poisoning in Wisconsin. This surpasses the total Canada goose mortality due to lead poisoning reported in the literature for North America. Although the majority of lead poisoning outbreaks among geese occurred in the spring, total mortality was equally distributed between fall and spring outbreaks. Lead poisoning mortality among whistling swans (*Olor columbianus*) in Wisconsin annually takes a small number of the spring migrating population. Seven duck species were known victims of lead poisoning in Wisconsin, but this disease was not considered an important mortality factor of ducks in the

state. The mallard (*Anas platyrhynchos*) was the major target of the disease. Some of the ecological factors found to be involved with lead poisoning of waterfowl in Wisconsin were climate, water levels, soil types, diet, and the timing of waterfowl migrations. The signs, pathological lesions, epizootiology, and significance of lead poisoning of waterfowl in Wisconsin were considered and discussed. A

579. Trainer, D. O., C. S. Schildt, R. A. Hunt, and L. R. Jahn. 1962. Prevalence of *Leucocytozoon simondi* among some Wisconsin waterfowl. *J. Wildl. Manage.* 26(2):137-143.

A total of 26 Canada geese (*Branta canadensis*), 2 years of age or less, native to the Crex [Meadows] area were examined for blood protozoa. One goose (4 percent) was infected with *Leucocytozoon anseris*. *Haemoproteus* was present in 4 birds (15 percent), and microfilaria was present in 2 geese (8 percent). All parasitemias were of low magnitude. A

580. Truett, E. A., III, and J. A. Bailey. 1973. Observations at the nest of a giant Canada goose at Noxubee National Wildlife Refuge. *Miss. Kite* 3:6-11.[ONS]

581. Tufts, R. W. 1932. Annual convention of winter geese. *Can. Field-Nat.* 46(3):51-53.

582. Turner, L. B. 1953. A rapid method of sexing Canada geese. *J. Wildl. Manage.* 17(4):542-543.

A quick method of sexing Canada geese is described. The sexual difference in the profile of the goose's head between the tip of the bill and the junction of forehead and crown is used. The male has a more wedge-shaped bill and forehead, while the female has a more distinctly concave profile. A straight edge can be placed against the bill and forehead to determine sex. The male also has a callosity or rounded protuberance that develops on the anterior edge of the wing at the wrist joint. The female lacks this feature, but does have relatively smoother tarsi and metatarsi than the male. Using these criteria sexing accuracy is comparable to cloacal examination and is much faster. It is less reliable with juvenile birds than with adults.

583. Turner, L. B. 1956. Improved technique in goose trapping with cannon-type net traps. *J. Wildl. Manage.* 20(2):201-203.

Improvements in the technique and construction of the Dill cannon-type net trap are

discussed. Trap position, bait, use of blinds, blasting cap wiring system, charge types, and other hints are covered.

584. Twedt, C. M. 1968. Investigations into rearing and restoration of breeding Canada geese (*Branta canadensis*) in South Dakota, 1966-67. South Dakota Department of Game Fish and Parks. P-R Rep. Proj. W-75-R-9. 7 pp.

Progress report on South Dakota's project to restore free-flying resident geese in suitable habitat throughout the State.

585. U.S. Fish and Wildlife Service. 1965-1972. Wildlife administrative reports. U.S. Fish and Wildl. Serv., Migratory Bird Population Station.

No. 75. 1965. Distribution of Canada goose band recoveries among states and provinces, based on bandings 1959-1963 in eastern North America. (Prepared by J. A. McCann and R. I. Smith.) 16 pp.

No. 76. 1965. Distribution and degree of registration of the Canada goose kill in Wisconsin and Illinois, 1963 and 1964. (Prepared by A. D. Geis and S. M. Carney.) 7 pp.

No. 93. 1965. Effects of the 3-goose bag limit on the kill of Canada geese in the Atlantic Flyway. (Prepared by J. A. McCann.) 2 pp.

No. 94. 1965. Canada goose recovery rates and relative recovery rates from bandings in eastern North America during 1959-64. (Prepared by J. A. McCann.) 10 pp.

No. 105. 1966. Canada goose surveys in eastern Canada—progress report, 1956, 1962-65. (Prepared by C. F. Kaczynski and E. B. Chamberlain.) 16 pp.

No. 108. 1966. Winter banding of mallards, black ducks, wood ducks, and Canada geese; 1966. (Prepared by R. K. Martinson.) 11 pp.

No. 123. 1966. Effectiveness of the quota system in controlling the harvest of Mississippi Valley Canada goose flock. (Prepared by A. D. Geis and S. M. Carney.) 5 pp.

No. 124. 1966. A preliminary estimate of the Canada goose kill during the first three days of the 1966 Wisconsin goose season. (Prepared by S. M. Carney and A. D. Geis.) 3 pp.

No. 146. 1968. Observations on the size and rate of hunting kill of the Mississippi Valley Goose Population in 1966. (Prepared by S. M. Carney and A. D. Geis.) 18 pp.

No. 154. 1968. Observations on the size of the hunting kill of the Mississippi Valley Canada Goose Population in 1967. (Prepared by S. M. Carney.) 3 pp.

No. 167. 1969. An estimate of the effects of change in the daily bag limit of Canada geese and white-fronted geese for the 1967 hunting season in the Central Flyway. (Prepared by S. M. Carney and R. L. Croft.) 5 pp.

No. 184. 1970. Summaries of species composition and age ratio estimates for geese bagged during the 1969 compared to 1968 hunting season. (Prepared by R. L. Croft and S. M. Carney.) 9 pp.

No. 187. 1970. Effects of the 3-goose limit during the 1969 Canada goose season in the Atlantic Flyway. (Prepared by S. M. Carney.) 2 pp.

No. 191. 1970. Observations on Canada goose daily bag limits and season length in selected counties of Oklahoma. (Prepared by S. M. Carney.) 4 pp.

No. 202. 1971. Species composition and age ratios of geese bagged during the 1969 and 1970 hunting seasons. (Prepared by R. L. Croft and S. M. Carney.) 9 pp.

No. 217. 1972. Species composition and age ratios of geese bagged during the 1970 and 1971 hunting seasons. (Prepared by M. F. Sorensen and S. M. Carney.) 10 pp.

586. Van Den Akker, J. B., and V. T. Wilson. 1949. Twenty years of bird banding at Bear River Migratory Bird Refuge, Utah. *J. Wildl. Manage.* 13(4):359-376.

Includes banding data for Canada geese banded at Bear River Refuge, 1929-48. Goose returns are discussed in a separate section.

587. Vaught, R. W. 1960. Geese by the tub-full. *Mo. Conserv.* 21(7):6-7, 10. [ONS]

588. Vaught, R. W. 1962. Canada goose kill statistics, Swan Lake Public Hunting Area. Missouri Conservation Commission. 11 pp. [ONS]

589. Vaught, R. W. 1968. Problems and economics of Canada goose management in the Mississippi Flyway. Pages 25-29 in R. L. Hine and C. Schoenfeld, eds. *Canada goose management*. Dembar Educational Research Services. Madison, Wis. 195 pp.

590. Vaught, R. W. 1970. Study of migration and mortality of geese in Missouri. Missouri Conservation Commission. 49 pp. [ONS]

591. Vaught, R. W. 1970. Canadian nesting ground studies of Canada geese. Missouri Conservation Commission. 16 pp. [ONS]

592. Vaught, R. W., and G. C. Arthur. 1965. Migration routes and mortality rates of Canada geese banded in the Hudson Bay lowlands. *J. Wildl. Manage.* 29(2):244-252.

A total of 454 Canada geese (*Branta canadensis interior*) were banded along coastal areas of western Hudson Bay during 1955, 1956, 1960, and 1961, to obtain data on hunting mortality and migrational patterns. Secondary objectives involved capturing techniques and measurement of production. Banding returns show that geese which nest between the Owl and Machichi rivers are associated with the Eastern Prairie population that winters in Swan Lake National Wildlife Refuge in north-central Missouri. Geese that nest in the coastal lowlands between the Mistigoken and Shagamu rivers are associated with the Mississippi Valley population that winter in southern Illinois. First-year hunting mortality for 1955, 1956, 1960, and 1961 bandings were 12.8, 15.6, 10.4, and 5.4 percent, respectively. Total hunting mortality of the 1955 and 1956 bandings were 26.9 and 21.9 percent, respectively. Production as indicated by stream census in 1956 was later reflected by population trends at Swan Lake National Wildlife Refuge.

A

593. Vaught, R. W., and L. M. Kirsch. 1966. Canada geese of the Eastern Prairie Population, with special reference to the Swan Lake flock. *Mo. Dep. Conserv. Tech. Bull.* 3. 91 pp.

At Swan Lake Wildlife Refuge, management resulted in population increases from a complete absence of geese in 1937 to a peak of 133,000 in 1955. Annual banding was begun in 1948 to gain information needed for sound management. The report is primarily an analysis of the 3,762 band recoveries reported from 18,707 Canada geese banded from 1948 to 1960. A history of goose management at Swan Lake, some management techniques, and recommendations for future management are also included.

594. Vaught, R. W., A. J. Pakulak, and J. P. Ryder. 1970. Canadian nesting ground studies of Canada geese. Missouri Conservation Commission. 78 pp. [ONS]

Three parts: one is a Canada goose nesting ground study of the Eastern Prairie Population, the second is nesting distribution and banding opportunities of Canada geese in northern Manitoba, and the last is an analysis

of the 1968-69 Canada goose band recoveries from the Churchill area.

595. Vermeer, K. 1970. A study of Canada geese, *Branta canadensis*, nesting on islands in south-eastern Alberta. *Can. J. Zool.* 48(2):235-240.

Canada goose clutches situated on islands in Dowling Lake and Lake Newell, Alberta, were checked from laying to hatching. Egg-laying intervals averaged 1.87 days and incubation periods 26.8 days. The distribution of nests showed a significant deviation from randomness in the direction of uniform spacing. Causes of extensive hatching failure at Dowling Lake were predation and desertion. Predation by coyotes was facilitated by low water levels. A preference for nesting on islands appears to be a mechanism to counteract mammalian predation. A

596. Waddell, B. 1966. The giant Canada goose project. *Izaak Walton* 31(4):4-5. [ONS]

597. Waggy, C. D. 1973. Breeding ecology of the Canada goose at the McClintic Wildlife Station. M.S. Thesis. West Virginia Univ., Morgantown. 81 pp. [ONS]

598. Wagner, R. 1963. Banding the Canada. *Wyo. Wildl.* 27(9):29-33. [ONS]

599. Warhurst, R. A. 1974. Characteristics of giant Canada geese gang broods near southwestern Lake Erie. M.S. Thesis. Ohio State Univ., Columbus. 133 pp. [ONS]

600. Wehr, E. E., and C. M. Herman. 1954. Age as a factor in acquisition of parasites by Canada geese. *J. Wildl. Manage.* 18(2):239-247.

Examination of 46 Canada goose goslings yielded 14 species of parasites including five Protozoa, four Nematoda, two Cestoda, and three Trematoda. Evidence indicates that goslings acquired most of these infections during their first week of life. Some parasites, *Prosthogonimus* sp., occurred only in younger birds. Others, *Leucocytozoon simondi*, were evident only during the initial course of infection, while still others remained evident in older geese. Parasites with a direct life cycle appeared to be more prevalent than those requiring intermediate hosts. Among 29 birds from a refuge in Michigan [Seney], 14 species of parasites were found; while in 17 goslings from a Utah refuge [Bear River], only five species occurred. A

601. Weigand, J. P. 1960. Breeding characteristics of a captive flock of Canada geese. M.S. Thesis. Michigan State Univ., East Lansing. 45 pp. [ONS]

602. Weigand, J. P., M. J. Pollok, and G. A. Petrides. 1968. Some aspects of reproduction of captive Canada geese. *J. Wildl. Manage.* 32(4):894-905.

An attempt was made to gather basic information on the behavior, nesting density, and productivity of a captive Canada goose (*Branta canadensis maxima*) flock in south-central Michigan. The 45.5-acre study area included 28.2 acres of land, a small stream, and an 8.3-acre impoundment. During the 1959 nesting season 110 pairs of Canada geese were studied. Territorial behavior, relationships with unmated geese, and re-mating of widowed geese are discussed. Geese preferred islands, floating platforms, and ditchbanks for nesting. Desertion of nest sites was believed due primarily to overcrowding. Average clutch size for the period 1953-61 was 5.6 eggs. Seventy percent of the geese re-nested after the first clutch was taken for artificial incubation. No significant difference was found between sizes of first and second clutches. Hatching success for incubator and naturally hatched eggs was 37.6 and 66.1 percent, respectively. Reproductive success of birds induced to lay two clutches was depressed by low incubator-hatching rates. Remedial suggestions for management and future studies are presented. A

603. West, D. L. 1976. Nesting habits of resident Canada geese (*Branta canadensis maxima*) in Jackson County, Tennessee. *Tenn. Wildl. Resour. Tech. Rep.* 76-1. 77 pp.

A study of a resident, free-flying flock of Canada geese (*Branta canadensis maxima*) on the Cumberland River (Jackson County, Tennessee) was conducted from February, 1975 through January 31, 1976. Certain aspects of nesting behavior of this population were explored.

The geese inhabited the Cordell Hull Wildlife Management Area within Free State Community which borders the Cumberland River. The flock was separated into the family flock and non-paired birds. Five nests were found during the study and produced a total of 10 goslings. Nests were constructed by the female who appeared to favor elevated nesting sites. During incubation, the female was absent from the nest for only 4-10 minutes during the afternoon. Turning or changing positions on the

eggs occurred every 20-30 minutes. The territory was comprised of the nest and surroundings and was established by the male at the time incubation began, varying in size until the young left the nest. Social displays and territorial behavior patterns heightened the female's urge to incubate. Young did not return to the nest. A

604. Wickware, A. B. 1941. Notes on miscellaneous diseases of geese. *Can. J. Comp. Med.* 5:21-24. [ONS]

605. Wilfrid, Rev. Brother. 1924. Notes on the Canada goose in captivity. *Can. Field-Nat.* 38(7):124.

606. Will, G. C. 1969. Productivity of Canada geese in Larimer County, Colorado, 1967-1968. M.S. Thesis, Colorado State Univ., Fort Collins. 144 pp. [ONS]

607. Will, G. C., and G. I. Crawford. 1970. Elevated and floating nest structures for Canada geese. *J. Wildl. Manage.* 34(3):583-586.

Two types of goose nesting structures have been designed by the Colorado Division of Game, Fish and Parks. These structures are being used successfully by a resident flock of Canada geese (*Branta canadensis*) in north-central Colorado, primarily Larimer County. The two types of structures are: (1) an elevated single-pole structure which consists of a nest box mounted on a 9-foot post, and (2) a floating canoe-like platform which supports a nest box. The materials, construction, and suggestions for erecting both types of structures are discussed. A

608. Williams, C. S. 1946. Rare egg-laying date for the Canada goose. *Auk* 63(3):438.

A fully developed egg was found in a Canada goose shot on 3 November 1945 on Maryland's eastern shore.

609. Williams, C. S. 1967. Honker. D. Van Nostrand Co., Princeton, N.J. 179 pp.

610. Williams, C. S., and W. H. Marshall. 1937. Goose nesting studies on Bear River Migratory Waterfowl Refuge. *J. Wildl. Manage.* 1(3-4):77-86.

The April and May Canada goose nesting period of 1937 on the Bear River Migratory Waterfowl Refuge, Utah, was studied. Ninety-five nests were found on 5,000 acres, 2,000 acres of which had emergent vegetation of

potential value for nesting cover. Nest site selection, vegetative cover, and proximity to water are discussed. In 84 nests with complete records, 410 eggs were laid, of which 81% hatched. Of the remaining 19%, 6% were infertile, 4% were deserted, 4% preyed upon, 2% flooded, and 2% destroyed by other causes. The effect of predation on goose nesting was found to be negligible. Management suggestions are included.

611. Williams, C. S., and W. H. Marshall. 1938. Survival of Canada goose goslings, Bear River Refuge, Utah, 1937. *J. Wildl. Manage.* 2(1):17-19.

Counts of 2,599 broods were made during May and June 1937. These suggested an average brood size of 4.87 and 4.73 for May and June, respectively, with these means being based on approximately 70% of the broods. Observations on brood behavior and mortality are included.

612. Williams, C. S., and M. C. Nelson. 1943. Canada Goose nests and eggs. *Auk* 60(3):341-345.

One hundred and seventy-four eggs and more than 100 nests of geese breeding in northern Utah were measured. Nest construction, site selection, and egg observations are discussed. Depth, cup diameter, and overall diameter of the nests, and length and width of the eggs are recorded in tables.

613. Williams, C. S., and C. A. Sooter. 1940. Canada goose habitats in Utah and Oregon. *Trans. N. Am. Wildl. Conf.* 5:383-387.

"The environment most important to geese is that required for breeding. It must not only meet the needs for nesting but must also contain within a comparatively limited area acceptable conditions for molting, brooding, resting, and feeding." A tabulation gives the number and percentage of nests in various types of cover in both States; they were most numerous in hardstem bulrush. Muskrat lodges were important as foundations for goose nests. Other preferences and habits of the birds, and how they may be catered to in management, are pointed out. WR

614. Williams, J. E. 1965. Energy requirements of the Canada goose in relation to distribution and migration. Ph.D. Thesis. Univ. Illinois, Urbana. 112 pp.

The present study determined that by per-

forming northward and southward migrations, the population of Canada geese maintains about the same level of existence requirements throughout the year. Although the population is apparently physiologically capable of wintering on the breeding grounds, the absence of winter food makes southward migration necessary. Since northward migration in spring does not gain a more favorable energy balance for the geese, factors other than energy economy must therefore be responsible for this species' northward migration and distribution. WR

615. Williams, J. I., and D. O. Trainer. 1971. A hematological study of snow, blue and Canada geese. *J. Wildl. Dis.* 7(4):258-265.

Hematological values, including erythrocyte counts, hematocrit and hemoglobin values, and total and differential leucocyte counts, were measured at approximately 30-day intervals during a calendar year in adult snow (*Chen caerulescens*), blue (*Chen caerulescens*) and Canada geese (*Branta canadensis interior*). Blood samples from approximately 10 birds (range 3-14) of each type of goose were examined at each bleeding period. Erythrocyte counts for snow and blue geese were very similar and slightly higher than those recorded for Canada geese. Seasonal trends were evident for erythrocyte, hematocrit, and hemoglobin measurements. The highest erythrocyte counts occurred during the winter and spring; the lowest during the summer. Hematocrit and hemoglobin values were highest in the winter and early spring and at their lowest level in the fall. Total and differential leucocyte counts revealed no obvious species or seasonal variations. There were no hematological differences detected between males and females. This is the first report of a detailed hematological study of snow, blue, and Canada geese. A

616. Williams, T. C., T. J. Klonowski, and P. Berkeley. 1976. Angle of Canada Goose V flight formation measured by radar. *Auk* 93(3):554-559.

Variability of the V formation of Canada geese under almost identical weather conditions lead to the conclusion that the V formation is probably not the result of a simple aerodynamic relationship but may have behavioral components as well.

617. Wise, G. A. 1967. Canada goose mortality at Crab Orchard National Wildlife Refuge. M.S. Thesis. Southern Illinois Univ., Carbondale. 44 pp. [ONS]

618. Wood, J. S. 1964. Normal development and causes of reproductive failure in Canada geese. *J. Wildl. Manage.* 28(2):197-208.

This is a 4-year study of reproductive development, the effects of hormonal treatments on development, and the influence of reproductive suppression by adverse environmental conditions in 148 semidomesticated Canada geese (*Branta canadensis*). Chicken pituitaries, diethylstilbestrol, pregnant mare's serum, and photoperiod variation were used in several combinations to mature 2-year-old geese artificially and also to stimulate nonreproducing adults. Reproductive maturity normally occurs in the third year, but a small percentage of geese mature in the second year. A single subcutaneous injection of 2-year birds with 1.5 chicken pituitaries per bird resulted in marked follicular development but no oviductal development. Increased dosage did not change this response significantly. When these geese were placed under crowded conditions, the reproductive organs of nonreproducing 3-year-old geese matured normally and maintained a stimulated condition without ovulation. Administration of additional exogenous gonadotrophins had no further maturation effects. Subsequent release from crowding resulted in nesting within a few days without significant reduction in clutch size. It was postulated that reproductive failure resulted from a lack of ovulatory peaks in the secretion rate of the luteinizing hormone. Progesterone treatment of nonreproducing adult females did not induce ovulation. A

619. Wood, J. S. 1965. Some associations of behavior to reproductive development in Canada geese. *J. Wildl. Manage.* 29(2):237-244.

In the semidomesticated Canada goose (*Branta canadensis*), reproductive maturity is normally attained in the third year. A small percentage of geese become mature in the second year, and probably all first-year birds are immature. The onset of behavioral characteristics normally associated with maturity is not necessarily coincidental with physiological reproductive maturity. The behavioral *display patterns* in Canada geese may occur partly in response to neural stimulation, and this may account for their occurrence in immature individuals. Pairing occurs among physically immature birds and is not limited to periods of gonadal stimulation. Pairs containing immature individuals or pairs formed during periods of gonadal quiescence do not appear to be less

stable than those between mature individuals or those formed during periods of gonadal stimulation. Territorial defense occurs in three phases. The first two phases were observed in both *fruitful* and *unfruitful* pairs. The third phase, when it occurred, always preceded an attempt to nest within 7 days. Territorial defense may be undertaken by physically immature individuals and does not necessarily indicate sexual maturity. A

620. Wooldridge, D. 1960. Geese in a tub. *Mo. Conserv.* 21(7):8-9. [ONS]

621. Wrakestraw, G. F. 1961. Season bag restriction of Canada geese. *Wyoming Game and Fish Commission Report.* 7 pp. [ONS]

622. Wrakestraw, G. 1969. Room and board for geese. *Wyo. Wildl.* 33(4):26-27. [ONS]

623. Wuerdinger, I. 1970. Erzeugung, ontogenie und funktion der lautsausserungen bei vier, (Gansarten *Anser indicus*, *A. caerulescens*, *A. albifrons* und *Branta canadensis*): Production, development, and function of the vocalization of four goose species (*Anser indicus*, *A. caerulescens*, *A. albifrons*, and *Branta canadensis*). *Z. Tierpsychol.* 27(3):257-302.

The mechanisms of sound production, the ontogeny of calls in relation to the development of anatomical structure, and the correlation between calls and actions or situations were investigated. A

624. Wuerdinger, I. 1975. Comparative morphological studies on the development of young *Anser* spp. and *Branta* spp. *J. Ornithol.* 116(1):65-86. [ONS]

625. Yancey, R. K. 1954. The future of Louisiana's Canada goose. *La. Conserv.* 6(9):10-11.

Reviews decline of Louisiana goose flocks and lays blame directly on shortstopping in northern areas like Horseshoe Lake, Illinois.

626. Yeager, L. E., and W. H. Elder. 1945. Pre- and post-hunting season foods of racoons on an Illinois goose refuge. *J. Wildl. Manage.* 9(1):48-56.

The effect of the abundance of crippled or dead Canada geese on the food habits of racoons around the Horseshoe Lake Refuge, Illinois, was studied by examining scats. One hundred sixteen pre-hunting-season scats and 107 post-hunting-season scats were analyzed. By bulk, the pre-hunting (early autumn) food was

33.8% animal materials, of which 30% were insects. In the post-hunting (winter) sample, 72.1% was of animal origin, of which 65.1% were Canada geese. Carnivores other than raccoons utilizing the geese included red foxes, grey foxes, opossums, minks, skunks, and feral dogs.

627. Yelverton, C. S. 1956. Food habits of the Canada goose, *Branta canadensis* Linnaeus, at Lake Mattamuskeet, North Carolina. M.S. Thesis. North Carolina State Univ., Raleigh. 201 pp. [ONS]
628. Yelverton, C. S., and T. L. Quay. 1959. Food habits of the Canada goose at Lake Mattamuskeet, North Carolina. North Carolina Wildlife Resources Commission. 44 pp.
- The food habits of Canada geese wintering at Lake Mattamuskeet were studied through analysis of 263 gizzards and 31 crops collected during the hunting seasons of 1951-52 and 1953-54. Sedges (Cyperaceae) constituted 63% of the total food volume and grasses (Graminae), 33%. Animal matter totaled only 0.01%. Tables list all species consumed, total frequency and volume, and percent frequency and volume figures.
629. Yocom, C. F. 1952. Techniques used to increase nesting of Canada geese. *J. Wildl. Manage.* 16(4):425-428.
- A survey of breeding Canada geese (*Branta canadensis moffitti*) in Washington State is presented. An area sportsmen's association supplemented the available nest sites by placing woven basket-type structures made of willow twigs in trees and dead snags along rivers used for nesting. Different types of the basket nest structures are discussed along with the estimated value and production from their use.
630. Yocom, C. F. 1956. Man-made homes for Canada geese. *Audubon Mag.* 58(3):106-109, 127.
- Description of the construction and placement of basket nests of woven willow twigs for use by Canada geese in the State of Washington. These woven baskets, along with galvanized washtubs, have proven very successful in attracting nesting geese when placed high in trees along waterways. Man-made nest use and gosling production are discussed.
631. Yocom, C. F. 1961. Recent changes in Canada goose populations in geographical areas in Washington. *Murrelet* 42(2):13-21.
- Presumably resulting from man-caused habitat changes, the Canada goose nesting population has markedly increased in recent years in eastern Washington. Nesting densities of four to five pairs per mile were found along the Columbia River as early as 1950.
632. Yocom, C. F. 1962. History of the Great Basin Canada goose in the Pacific Northwest and adjacent areas. *Murrelet* 43(1):1-9. [ONS]
633. Yocom, C. F. 1964. Of men and geese. *Pac. Discovery* 17(2):2-9.
- This well-illustrated article is an account of the recent expansion of the breeding range of the Canada goose in northwestern U.S. Nine factors are cited as being related to this range expansion and population increase. WR
634. Yocom, C. F. 1965. Estimated populations of Great Basin Canada geese over their breeding range in western Canada and western United States. *Murrelet* 46(2):19-26.
- There may have been over 17,000 breeding pairs of Great Basin Canada geese in the breeding range, including British Columbia, Alberta, southwestern Saskatchewan, Washington, Idaho, Montana, North and South Dakota, Colorado, Wyoming, Utah, Nevada, northeastern California, and Oregon. In the fall of 1951, there may have been over 120,000 total geese, including 61,450 young of the year, 34,300 breeding adults, and 34,000 1- and 2-year-old geese. Each State or Province is discussed on an individual basis.
635. Yocom, C. F. 1967. Where the goose nests. *Pac. Discovery* 20(6):26-30.
- Management practices that may contribute favorably to the welfare of *Branta canadensis moffitti* in the western states and provinces are outlined. WR
636. Yocom, C. F. 1970. The giant Canada goose in New Zealand. *Auk* 87(4):812-814.
- The Canada geese of New Zealand are identified as *Branta canadensis maxima*. Description and photographs are included.
637. Yocom, C. F. 1972. Weights and measurements of Taverner's Canada geese and Great Basin Canada geese. *Murrelet* 53(2):33-34. [ONS]

638. Yocom, C. F., C. L. Buechele, and S. W. Harris. 1956. Great Basin Canada goose nesting populations at the former Lake Lenore National Wildlife Refuge, Washington. *Murrelet* 37(2):14-17.
- The nesting population of the Great Basin Canada goose (*Branta canadensis moffitti*) on Lake Lenore was studied 6-8 April 1952 and 6-9 April 1953. A detailed description of Lake Lenore is included. It was estimated that about 50 pairs of geese nested annually at Lake Lenore.
639. Yocom, C. F., and S. W. Harris. 1965. Plumage descriptions and age data for Canada goose goslings. *J. Wildl. Manage.* 29(4):874-877.
- Eight stages of plumage development and the equivalent age in days are presented for goslings of great basin Canada geese (*Branta canadensis moffitti*), which permit the field-aging of Canada geese broods between the time of hatching and the time of flying. A
640. Yocom, C. F., and S. W. Harris. 1966. Growth rates of Great Basin Canada geese. *Murrelet* 47(2):33-37.
- Growth rates and growth curves are presented for Great Basin Canada geese for the first 11 weeks of life. Six to nine different measurements were taken. Weight, length of exposed culmen, and length of tarsus were selected for analysis.
641. Yokota, Y., K. Hoshiko, M. Takeishi, and T. Nishide. 1976. The migration course of geese wintering at Lake Izunuma. Part 2—origin of the flocks in Ishikari Plain Hokkaido, Japan. *Misc. Rep. Yamashina Inst. Ornithol.* 8(1):38-52. [ONS]
642. Yokota, Y., and T. Nishide. 1974. On the migration course of geese wintering at Lake Izunuma. *Misc. Rep. Yamashina Inst. Ornithol.* 7(3):309-323. [ONS]
643. Zicus, M. C. 1975. Capturing nesting Canada Geese with mist nets. *Bird-Banding* 46(2):168-169.
- A successful technique for capturing nesting female Canada geese by flushing them into mist nets is fully described.
644. Zicus, M. C. 1975. Loon predation on a Canada Goose gosling. *Auk* 92(3):611-612.
645. Zicus, M. C. 1976. Fall flock behavior of Canada geese resident at Crex Meadows, Wisconsin. Ph.D. Thesis. Univ. Minnesota, Minneapolis. 92 pp. [ONS]
646. Zinkl, J. G., J. J. Hurt, J. M. Hyland, N. Dey, D. Studnicka, and D. D. King. 1977. Treatment of captive giant Canada geese affected by avian cholera. *J. Wildl. Dis.* 13(3):294-296. [ONS]

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