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A BIBLIOGRAPHY OF INTEREST IN THE UTILIZATION OF
VASCULAR AQUATIC PLANTS

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Little (1968) and Boyd (1968, 1969) emphasized the food resources that could possibly be developed from native populations of vascular aquatic plants. The utilization of aquatic vegetation as a raw material for leaf protein extraction represents a new source of protein for human diets. Aquatic weeds could also be used extensively in livestock rations in many areas. The use of aquatic macrophytes as food plants is obviously important from the standpoint of alleviating food shortages in certain localities. Furthermore, aquatic weed growths frequently interfere with the utilization of aquatic resources and waterways (see review by Holm, Weldon, & Blackburn, 1969). In many instances chemical and biological control of water weeds is ineffective (Boyd, 1971) and management procedures involving mechanical removal of plants may prove necessary. These plants should then be used as food to offset the cost of removal.

Vascular aquatic plants may also be an effective means of stripping nutrients from excessively eutrophic natural waters or from effluents (Hasler, 1969; Steward, 1970; Yount & Crossman, 1970; Boyd, 1970). These plants should also be used as feedstuffs.

Relatively few studies have been conducted on the utilization of aquatic weeds. Little (1968) listed 50 papers on the subject, and only a few reports have been published since his compilation. During recent months interest in the utilization of aquatic plants has increased, particularly with respect to the

use of these plants for nutrient removal. The need for aquatic plant management as opposed to the eradication of water weeds with herbicides is receiving increased recognition. Studies and applications of aquatic weed utilization and management will require information on chemical composition, nutrition, production, and ecology of aquatic plants. Data on nutrient relationships in aquatic environments will also be needed. Appendix I includes references to papers on the subjects listed above. This compilation is obviously not a complete bibliography of the literature on vascular aquatic plants. However, these selected references will be useful to research workers.

Appendix I does not include references to chemical and biological control. Reviews by Greenwald (1956, 1957), Hall (1961), Lawrence (1962, 1966) and Little (1966) can be consulted regarding aquatic weed control.

Studies of the vegetation of swamps and marshes contain information on the natural history of species and communities of aquatic plants which will be useful to those interested in managing and harvesting the plant production of wetlands. No attempt was made to include studies of general aspects of wetland plant communities in Appendix I. However, papers by Wright & Wright (1932), Penfound & Hathaway (1938), Penfound & Hall (1939), Hall & Penfound (1939, 1943), Egler (1952), Penfound (1952) and Loveless (1959) can serve as a starting point for a review of this subject.

Current information regarding ongoing research of many aspects of aquatic plant biology can be found in

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the *Newsletter of the Association of Aquatic Vascular Plant Biologist*. This newsletter will be provided on request to the editor, Dr. C. P. McRoy, Institute of Marine Science, University of Alaska, College, Alaska. Current bibliographies of aquatic plant literature are included in *Benthic, Macroinvertebrates and Periphyton, Select and Current Bibliographies*. This bibliography has been published annually since 1965 and can be obtained from the Midwest Benthological Society. *Weed Abstracts, Pollution Abstracts* and *Eutrophication Abstracts* are especially valuable abstracting journals for workers interested in the utilization of aquatic plants. The Weed Science Society of America has an active aquatic weed division and the abstracts and proceedings of national and various regional meetings should be consulted. The Hyacinth Control Society, P. O. Box 9087, Fort Lauderdale, Florida, publishes the proceedings of their annual meeting (*Hyacinth Control J.*). Reference to this publication will be particularly valuable to workers in the southeastern United States.

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Literature Cited

- Boyd, C. E. 1968. Fresh-water plants: A potential source of protein. *Econ. Bot.* **22**: 359-368.
- . 1969. The nutritive value of three species of water weeds. *Econ. Bot.* **23**: 123-127.
- . 1970. Vascular aquatic plants for mineral nutrient removal from polluted waters. *Econ. Bot.* **24**: 95-103.
- . 1971. The limnological role of aquatic macrophytes and their relationship to reservoir management, pp. 153-168. *In*: G. E. Hall (ed.). *Reservoir Fisheries and Limnology*, Spec. Publ. No. 8, Amer. Fish. Soc., Washington, D.C.
- Egler, F. E. 1952. Southeast saline Everglades vegetation, Florida, and its management. *Vegetatio* **3**: 213-265.
- Greenwald, M. 1956. List of references on control of aquatic plants including algae. Bull. Chipman Chem. Co.
- . 1957. Supplement to the list of references on control of aquatic plants including algae. Bull. Chipman Chem. Co.
- Hall, T. F. 1961. Principles of aquatic plant control. *Adv. Pest Control Res.* **4**: 211-247.
- & W. T. Penfound. 1939. A phytosociological analysis of a cypress-gum swamp in southeastern Louisiana. *Amer. Midl. Nat.* **21**: 378-395.
- & ———. 1943. Cypress-gum communities in the Blue-Girth Swamp near Selma, Alabama. *Ecology* **24**: 208-217.
- Hasler, A. D. 1969. Cultural eutrophication is reversible. *Bioscience* **19**: 425-431.
- Holm, L. G., L. W. Weldon & R. D. Blackburn. Aquatic weeds. *Science* **166**: 699-709.
- Lawrence, J. M. 1962. Aquatic herbicide data. *Agric. Handbook*. U. S. Dept. Agric. U. S. Gov. Printing Office, Washington, D. C.
- . 1966. Aquatic weed control in fish ponds. *In*: F.A.O. Symposium on Warm-Water Pond Fish Culture, Rome.
- Little, E. C. S. 1968a. Handbook of utilization of aquatic plants. F.A.O., Rome.
- . 1968b. The control of water weeds. *Weed Res.* **8**: 79-105.
- Loveless, C. M. 1959. A study of the vegetation in the Florida Everglades. *Ecology* **40**: 1-9.
- Penfound, W. T. 1952. Southern swamps and marshes. *Bot. Rev.* **18**: 413-446.
- & E. S. Hathaway. 1938. Plant communities of the marshlands of southeastern Louisiana. *Ecol. Monogr.* **8**: 1-56.
- & T. F. Hall. 1939. A phytosociological analysis of a tupelo gum forest near Huntsville, Alabama. *Ecology* **20**: 358-364.
- Steward, K. K. 1970. Nutrient removal potentials of various aquatic plants. *Hyacinth Control J.* **8**: 34-35.
- Wright, A. H. & A. A. Wright. 1932. The habitats and composition of the vegetation of Okefinokee Swamp, Georgia. *Ecol. Monogr.* **2**: 109-232.
- Yount, J. L. & R. A. Crossman, Jr. 1970. Eutrophication control by plant harvesting. *J. Water Poll. Control Fed.* **42**: 173-183.

Appendix I

1. Allen, S. E. & W. H. Pearsall. 1963. Leaf analysis and shoot production in *Phragmites*. *Oikos* 14: 176-189.
2. Allenby, K. G. 1967. The manganese and calcium contents of some aquatic plants and the water in which they grow. *Hydrobiologia* 29: 239-244.
3. ——. 1968. Some analyses of aquatic plants and waters. *Hydrobiologia* 32: 486-490.
4. Allsopp, A. 1965. Land and water forms: physiological aspects, p. 1236-1255. *In*: W. Ruhland (ed.). *Encyclopedia of Plant Physiology*, 15. Springer Verlag, Berlin.
5. Anderson, R. R., R. G. Brown & R. D. Rappleye. 1965. Mineral composition of Eurasian Water Milfoil, *Myriophyllum spicatum* L. *Chesapeake Sci.* 6: 68-72.
6. ——, —— & ——. 1966. The mineral content of *Myriophyllum spicatum* L. in relation to its aquatic environment. *Ecology* 47: 844-846.
7. Arbor, A. 1920. *Water plants: a study of aquatic angiosperms*. University Press, Cambridge.
8. Bailey, T. A. 1965. Commercial possibilities of dehydrated aquatic plants. *Proc. Southern Weed Conf.* 18: 543-551.
9. Barber, D. A. 1961. Gas exchange between *Equisetum limosum* and its environment. *J. Exp. Bot.* 12: 243-251.
10. Bedish, J. W. 1967. Cattail moisture requirements and their significance to marsh management. *Amer. Midl. Nat.* 78: 288-300.
11. Berman, T. 1970. Alkaline phosphatases and phosphorus availability in Lake Kinneret. *Limnol. Oceanogr.* 15: 663-674.
12. Bernatowicz, S. 1963. Dynamika flory naczyniowej w Jeziorze Arklickim. *Polskie Archiwum Hydrobiologii* 11: 145-156.
13. ——. 1965. Effects of mowing on the occurrence of macrophytes in the Ogal Maly lake. *Acta Hydrobiol.* 7: 71-82.
14. ——. 1969. Macrophytes in the Lake Warniak and their chemical composition. *Ekologia Polska — Seria A* 17: 447-467.
15. ——, E. Pieczyńska & J. Radziej. 1968. The biomass of macrophytes in Lake Sniardwy. *Bull. Acad. Pol. Sci.* 16: 625-629.
16. Bishai, H. M. 1962. The water characteristics of the Nile in the Sudan with a note on the effect of *Eichhornia crassipes* on the hydrobiology of the Nile. *Hydrobiologia* 19: 357-382.
17. Blackburn, R. D., P. F. White & L. W. Weldon. 1968. Ecology of submersed aquatic weeds in south Florida canals. *Weed Sci.* 16: 261-266.
18. Bock, J. H. 1969. Productivity of the water hyacinth *Eichhornia crassipes* (Mart.) Solms. *Ecology* 50: 460-464.
19. Bourn, W. S. 1932. Ecological and physiological studies on certain aquatic angiosperms. *Cont. Boyce Thompson Inst.* 4: 425-496.
20. Boyd, C. E. 1967. Some aspects of aquatic plant ecology, p. 114-127. *In*: *Reservoir Fishery Resources Symposium*. Univ. of Georgia Press, Athens.
21. ——. 1968. Fresh-water plants: A potential source of protein. *Econ. Bot.* 22: 359-368.
22. ——. 1969. Production, mineral nutrient absorption, and biochemical assimilation by *Justicia americana* and *Alternanthera philoxeroides*. *Arch. Hydrobiol.* 66: 159-160.
23. ——. 1969. The nutritive value of three species of water weeds. *Econ. Bot.* 23: 123-127.
24. ——. 1970. Chemical analyses of some vascular aquatic plants. *Archiv. Hydrobiol.* 67: 78-85.
25. ——. 1970. Amino acid, protein and caloric content of vascular aquatic macrophytes. *Ecology* 51: 902-906.
26. ——. 1970. Production, mineral accumulation and pigment concentrations in *Typha latifolia* and *Scirpus americanus*. *Ecology* 51: 285-290.
27. ——. 1970. Vascular aquatic plants for mineral nutrient removal from polluted waters. *Econ. Bot.* 24: 95-103.
28. ——. 1971. The dynamics of dry matter and chemical substances in a *Juncus effusus* population. *Amer. Midl. Nat.* 86: 28-45.
29. ——. 1971. The limnological role of aquatic macrophytes and their relationship to reservoir management, pp. 152-168. *In*: G. E. Hall (ed.). *Reservoir Fisheries and Limnology*, Spec. Publ. No. 8, Amer. Fish. Soc., Washington, D.C.
30. ——. 1971. Further studies on productivity, nutrient and pigment relationships in *Typha latifolia* populations. *Bull. Torrey Bot. Club* 98: 144-150.
31. ——. 1971. Leaf protein from aquatic plants, pp. 44-49. *In*: N. W. Pirie (ed.). *Leaf protein: Its Agronomy, Preparation, Quality and Use*. IBP

- Handbook No. 20, Blackwell Sci. Publ., Oxford.
32. — & L. W. Hess. 1970. Factors influencing shoot production and mineral nutrient levels in *Typha latifolia*. *Ecology* **51**: 296-300.
 33. — & D. H. Vickers. 1971. Relationships between production, nutrient accumulation and chlorophyll synthesis in an *Eleocharis quadrangulata* population. *Can. J. Bot.* **49**: 883-888.
 34. Bray, J. R. 1962. Estimates of energy budgets for a *Typha* (cattail) marsh. *Science* **136**: 1119-1120.
 35. Bristow, J. M. & M. Whitcombe. 1971. The role of roots in the nutrition of aquatic vascular plants. *Amer. J. Bot.* **58**: 8-13.
 36. Burkholder, P. R. 1956. Studies on the nutritive values of *Spartina* grass growing in the marsh areas of coastal Georgia. *Bull. Torrey Bot. Club* **83**: 327-334.
 37. —, L. M. Burkholder & J. A. Rivero. 1959. Some chemical constituents of turtle-grass, *Thalassia testudinum*. *Bull. Torrey Bot. Club* **86**: 88-93.
 38. Chadwick, M. J. & M. Obeid. 1966. A comparative study of the growth of *Eichhornia crassipes* Solms. and *Pistia stratiotes* L. in water-culture. *J. Ecol.* **54**: 563-575.
 39. Chapman, V. J. 1960. Salt marshes and salt deserts of the world. Interscience, New York.
 40. — & C. A. Bell (ed.). 1967. Rotorua and Waikato water weeds: problems and the search for a solution. Dept. Univ. Extension, Univ. Auckland, Auckland, New Zealand.
 41. Conway, V. M. 1940. Aeration and plant growth in wet soils. *Bot. Rev.* **6**: 149-163.
 42. Creger, C. R., F. M. Farr, E. Castro & J. R. Couch. 1963. The pigmenting value of aquatic flowering plants. *Poultry Sci.* **42**: 1262.
 43. Davies, G. S. 1970. Productivity of macrophytes in Marion Lake, British Columbia. *J. Fish. Res. Bd. Can.* **27**: 71-81.
 44. Davies, H. R. J. 1959. Effects of the water hyacinth (*Eichhornia crassipes*) in the Nile Valley. *Nature* **184**: 1085-1086.
 45. Donselaar, J. Van. 1968. Water and marsh plants in the artificial Brokoponds Lake (Surinam, S. America) during the first three years of its existence. *Acta Bot. Neerl.* **17**: 183-196.
 46. Dykyjová, D., J. P. Ondok & K. Přibán. 1970. Seasonal changes in productivity and vertical structure of reed-stands (*Phragmites communis* Trin.). *Photosynthetica* **4**: 280-287.
 47. —, K. Veber & K. Přibán. 1970. Production and root/shoot ratio of dominant reedswamp species growing in outdoor summer hydroponic cultures, p. 101-104. *In*: Productivity of terrestrial ecosystems. PT-PP/IBP Report No. 1, Praha.
 48. Edwards, D. 1969. Some effects of siltation upon aquatic macrophyte vegetation in rivers. *Hydrobiologia* **34**: 29-37.
 49. Edwards, R. W. 1968. Plants as oxygenators in rivers. *Water Res.* **2**: 243-248.
 50. — & M. Owens. 1960. The effects of plants on river conditions. I. Summer crops and estimates of net productivity of macrophytes in a chalk stream. *J. Ecol.* **48**: 151-160.
 51. Eyles, D. E. & J. Robertson, Jr. 1963. A guide and key to the aquatic plants of the southeastern United States. U.S. Dept. Interior Cir. 158. U.S. Gov. Printing Office, Washington, D.C.
 52. Fassett, N. C. 1960. A manual of aquatic plants. Univ. of Wisconsin Press, Madison.
 53. Fish, G. R. 1963. Observations on excessive weed growth in two lakes in New Zealand. *New Zealand J. Bot.* **1**: 410-418.
 54. — & G. M. Will. 1966. Fluctuations in the chemical composition of two lake weeds from New Zealand. *Weed Res.* **6**: 346-349.
 55. Fitzgerald, G. P. 1968. Detection of limiting or surplus nitrogen in algae and aquatic weeds. *J. Phycol.* **4**: 121-126.
 56. —. 1969. Field and laboratory evaluations of bioassays for nitrogen and phosphorus with algae and aquatic weeds. *Limnol. Oceanogr.* **14**: 206-214.
 57. —. 1969. Some factors in the competition or antagonism among bacteria, algae and aquatic weeds. *J. Phycol.* **5**: 351-359.
 58. —. 1970. Aerobic lake muds for the removal of phosphorus from lake waters. *Limnol. Oceanogr.* **15**: 550-555.
 59. —. 1970. Evaluations of the availability of sources of nitrogen and phosphorus for algae. *J. Phycol.* **6**: 239-247.
 60. Forsberg, C. 1959. Quantitative sam-

- pling of subaquatic vegetation. *Oikos* **10**: 233-240.
61. ———. 1960. Subaquatic macrovegetation in Ösbysjön, Djursholm. *Oikos* **11**: 183-199.
 62. Frink, C. R. 1967. Nutrient budget: rational analysis of eutrophication in a Connecticut lake. *Environ. Sci. Tech.* **1**: 425-428.
 63. ———. 1969. Fractionation of phosphorus in lake sediments: analytical evaluation. *Soil Sci. Soc. Amer. Proc.* **33**: 326-328.
 64. ———. 1969. Chemical and mineralogical characteristics of eutrophic lake sediments. *Soil Sci. Soc. Amer. Proc.* **33**: 369-372.
 65. Gay, P. A. 1960. Ecological studies of *Eichhornia crassipes* Solms. in the Sudan. I. Analysis of spread in the Nile. *J. Ecol.* **48**: 183-191.
 66. Gerloff, G. C. 1969. Evaluating nutrient supplies for the growth of aquatic plants in natural water, p. 537-555. *In*: Eutrophication: Causes, Consequences, Correctives. Nat. Acad. Sci., Washington, D. C.
 67. ——— & P. H. Krombholz. 1966. Tissue analysis as a measure of nutrient availability for the growth of angiosperm aquatic plants. *Limnol. Oceanogr.* **11**: 529-537.
 68. ———, D. D. Moore & J. T. Curtis. 1964. Mineral content of native plants of Wisconsin. Agric. Experiment Sta., Univ. Wisconsin, Research Report 14.
 69. Gessner, F. 1955. Hydrobotanik: die physiologischen Grundlagen der Pflanzenverbreitung im Wasser. I. Energiehaushalt. VEB Deutscher Verlag der Wissenschaften, Berlin.
 70. ———. 1959. Hydrobotanik: die physiologischen Grundlagen der Pflanzenverbreitung im Wasser. II. Stoffhaushalt. VEB Deutscher Verlag der Wissenschaften, Berlin.
 71. Golterman, H. L. 1966. Influence of soil on the chemistry of water in relation to productivity. *In*: F.A.O. Symposium on Warm-water Pond Fish Culture, Rome.
 72. Gorham, E. 1953. Chemical studies on the soils and vegetation of waterlogged habitats in the English Lake District. *J. Ecol.* **41**: 345-360.
 73. ——— & W. H. Pearsall. 1956. Production ecology. III. Shoot production in *Phragmites* in relation to habitat. *Oikos*, **7**: 206-214.
 74. Gortner, R. A. 1934. Lake vegetation as a possible source of forage. *Science* **80**: 531-533.
 75. Goulder, R. 1969. Interactions between the rates of production of a freshwater macrophyte and phytoplankton in a pond. *Oikos* **20**: 300-309.
 76. ———. 1970. Day-time variation in the rates of production by two natural communities of submerged freshwater macrophytes. *J. Ecol.* **58**: 521-528.
 77. Guillard, A. J. 1969. The effect of land usage on aquatic and semiaquatic vegetation at high altitudes in southern Africa. *Hydrobiologia* **34**: 3-13.
 78. Hall, K. J., W. C. Weimer & G. F. Lee. 1970. Amino acids in an estuarine environment. *Limnol. Oceanogr.* **15**: 162-164.
 79. Hall, T. F. 1940. The biology of *Saururus cernuus* L. *Amer. Midl. Nat.* **24**: 253-260.
 80. ——— & W. T. Penfound. 1944. The biology of the American lotus, *Nelumbo lutea* (Willd.) Pers. *Amer. Midl. Nat.* **31**: 744-758.
 81. Hambric, R. N. 1965. The nature and extent of aquatic vegetation problems in southeast Texas. *Proc. Southern Weed Conf.* **18**: 458-463.
 82. Harper, H. J. & H. A. Daniel. 1934. Chemical composition of certain aquatic plants. *Bot. Gazette* **96**: 186-189.
 83. Harter, R. D. 1968. Adsorption of phosphorus by lake sediment. *Soil Sci. Soc. Amer. Proc.* **32**: 514-518.
 84. Hartman, R. T. & D. L. Brown. 1967. Changes in internal atmosphere of submerged vascular hydrophytes in relation to photosynthesis. *Ecology* **48**: 252-258.
 85. Hasler, A. D. 1969. Cultural eutrophication is reversible. *Bioscience* **19**: 425-431.
 86. ——— & E. Jones. 1949. Demonstration of the antagonistic action of large aquatic plants on algae and rotifers. *Ecology* **30**: 359-364.
 87. Hayes, F. R. & J. E. Phillips. 1958. Lake water and sediment. IV. Radiophosphorus equilibrium with mud, plants, and bacteria under oxidized and reduced conditions. *Limnol. Oceanogr.* **3**: 459-475.
 88. ———, B. L. Reid & M. L. Cameron. 1958. Lake water and sediment. II. Oxidation-reduction relations at the mud-water interface. *Limnol. Oceanogr.* **3**: 308-317.
 89. Hopher, B. 1958. On the dynamics of

- phosphorus added to fish ponds in Israel. *Limnol. Oceanogr.* **3**: 84-100.
90. ——. 1966. Some limiting factors affecting the dose of fertilizers added to fish ponds, with special reference to the near East. *In*: F.A.O. Symposium on Warm-water Pond Fish Culture, Rome.
91. Hillman, W. S. 1961. The Lemnaceae, or duckweeds. A review of the descriptive and experimental literature. *Bot. Rev.* **27**: 221-289.
92. Holm, L. G., L. W. Weldon & R. D. Blackburn. 1969. Aquatic weeds. *Science* **166**: 699-709.
93. Hotchkiss, N. 1941. The limnological role of the higher plants, p. 152-162. *In*: A Symposium on Hydrobiology. Univ. Wisconsin Press, Madison.
94. ——. 1964. Pondweeds and pondweed-like plants of eastern North America. U.S. Dept. Interior Cir. 187. U.S. Gov. Printing Office, Washington, D.C.
95. ——. 1965. Bulrushes and bulrushlike plants of eastern North America. U.S. Dept. Interior Cir. 21. U.S. Gov. Printing Office, Washington, D.C.
96. Hynes, H. B. N. & B. J. Greib. 1970. Movement of phosphate and other ions from and through lake muds. *J. Fish. Res. Bd. Can.* **27**: 653-668.
97. Jervis, R. A. 1969. Primary production in the freshwater marsh ecosystem of Troy Meadows, New Jersey. *Bull. Torrey Bot. Club* **96**: 209-231.
98. Joanen, T. & L. L. Glasgow. 1965. Factors influencing the establishment of wigeongrass stands in Louisiana. *Ann. Conf. S. E. Game and Fish Comm.* **19**: 78-92.
99. Juday, C. 1934. The depth distribution of some aquatic plants. *Ecology* **15**: 325-331.
100. Keup, L. E. 1968. Phosphorus in flowing waters. *Water Res.* **2**: 373-386.
101. Kimmel, B. L. & O. T. Lind. 1970. Factors influencing orthophosphate concentration decline in the water of laboratory mud-water systems. *Texas J. Sci.* **21**: 339-445.
102. King, D. L. 1970. The role of carbon in eutrophication. *J. Water Poll. Control Fed.* **42**: 2035-2051.
103. Knight, A., R. C. Ball & F. F. Hooper. 1962. Some estimates of primary production rates in Michigan ponds. *Papers Michigan Acad. Sci., Arts, and Letters* **47**: 219-233.
104. Kuentzel, L. E. 1969. Bacteria, carbon dioxide, and algal blooms. *J. Water Poll. Control Fed.* **41**: 1737-1747.
105. Lange, S. R. 1965. The control of aquatic plants by commercial harvesting, processing and marketing. *Proc. Southern Weed Conf.* **18**: 536-542.
106. Lathwell, D. J., H. F. Mulligan & D. R. Bouldin. 1969. Chemical properties, physical properties and plant growth in twenty artificial wildlife marshes. *New York Fish and Game J.* **16**: 158-183.
107. Lawrence, J. M. 1968. Dynamics of chemical and physical characteristics of water, bottom muds, and aquatic life in a large impoundment on a river. *Agric. Exp. Sta., Auburn Univ., Auburn, Alabama, Zool.-Ent. Dept. Series, Fisheries No. 6.*
108. —— & L. W. Weldon. 1965. Identification of aquatic weeds. *Hyacinth Control J.* **4**: 5-17.
109. Lind C. T. & G. Cottam. 1969. The submerged aquatics of University Bay: A study in eutrophication. *Amer. Midl. Nat.* **81**: 353-369.
110. Little, E. C. S. 1966. The invasion of man-made lakes by plants, p. 75-86. *In*: R. H. Lowe-McConnell (ed.), *Man-made Lakes: Proc. 15th Symp. Inst. Biol., London, Academic Press, London.*
111. ——. 1967. Progress report on transpiration of some tropical water weeds. *Pest. Artic. C.* **13**: 127-132.
112. ——. 1968. Handbook of utilization of aquatic plants. F.A.O., Rome.
113. Livermore, D. F. & W. E. Wunderlich. 1969. Mechanical removal of organic production from waterways, p. 494-519. *In*: *Eutrophication: Causes, Consequences, Correctives.* Nat. Acad. Sci., Washington, D.C.
114. Low, J. B. & F. C. Bellrose. 1944. The seed and vegetative yield of waterfowl food plants in the Illinois River valley. *J. Wildlife Mgt.* **8**: 7-22.
115. Lowenhaupt, B. 1956. The transportation of calcium and other cations in submerged aquatic plants. *Biol. Rev.* **31**: 371-395.
116. Mackenthun, K. M. 1962. A review of algae, lake weeds, and nutrients. *J. Water Poll. Control Fed.* **34**: 1077-1085.
117. ——. 1965. Nitrogen and phosphorus in water. Public Health Serv. Publ. No. 1305. U. S. Gov. Printing Office, Washington, D. C.
118. —— & W. M. Ingram. 1969. Biological associated problems in freshwater environments. Their identification, investigation and control. U. S. Dept. Int.,

- Fed. Water Poll. Control Adm., U. S. Gov. Printing Office, Washington, D. C.
119. ———, ———, & R. Porges. 1964. Limnological aspects of recreational lakes. Public Health Serv. Publ. No. 1167. U. S. Gov. Printing Office, Washington, D. C.
 120. Marsh, L. C. 1955. The cattail story. *Garden J.*, July-August 1955: 114-117.
 121. Martin, D. F., M. T. Doug, III & D. K. Millard. 1970. Potential control of Florida clovea by ion-control agents. *Nature* 226: 181-182.
 122. Martin, J. B., Jr., B. N. Bradford & H. G. Kennedy. 1969. Factors affecting the growth of *Najas* in Pickwick Reservoir. Tennessee Valley Authority, Muscle Shoals, Alabama.
 123. Mason, R. 1960. Three waterweeds of the family *Hydrocharitaceae* in New Zealand. *New Zealand J. Sci.* 3: 382-395.
 124. Mayer, A. M. & E. Gorham. 1951. The iron and manganese content of plants present in the natural vegetation of the English Lake District. *Ann. Bot.* 15: 247-263.
 125. McClure, J. W. 1970. The secondary constituents of aquatic angiosperms, p. 233-268. *In*: J. B. Harborne (ed.). *Phytochemical Phylogeny*. Academic Press, N. Y.
 126. McMahan, C. A. 1968. Biomass and salinity tolerance of shoalgrass and manateegrass in Lower Laguna Madre, Texas. *J. Wildlife Mgt.* 32: 501-506.
 127. McMillan, C. 1959. Salt tolerance within a *Typha* population. *Amer. J. Bot.* 46: 521-526.
 128. McNaughton, S. J. 1966. Ecotype function in the *Typha* community-type. *Ecol. Monogr.* 36: 297-325.
 129. ———. 1968. Autotoxic feedback in the regulation of *Typha* populations. *Ecology* 49: 367-369.
 130. ——— & L. W. Fullem. 1970. Photosynthesis and photorespiration in *Typha latifolia*. *Plant Physiol.* 45: 703-707.
 131. McRoy, C. P. & R. J. Barsdate. 1970. Phosphate absorption in eelgrass. *Limnol. Oceanogr.* 15: 6-13.
 132. Meeks, R. L. 1969. The effect of draw-down date on wetland plant succession. *J. Wildlife Mgt.* 33: 817-821.
 133. Meyer, B. S. 1939. The daily cycle of apparent photosynthesis in a submerged aquatic. *Amer. J. Bot.* 26: 755-760.
 134. ——— & A. C. Heritage. 1941. Effect of turbidity and depth of immersion on apparent photosynthesis in *Ceratophyllum demersum*. *Ecology* 22: 17-22.
 135. ———, F. H. Bell, L. C. Thompson & E. I. Clay. 1943. Effect of depth of immersion on apparent photosynthesis in submerged vascular aquatics. *Ecology* 24: 395-399.
 136. Misra, R. D. 1938. Edaphic factors in the distribution of aquatic plants in the English Lakes. *J. Ecol.* 26: 411-451.
 137. Mitchell, D. S. 1968. The ecology of vascular hydrophytes on Lake Kariba. *Hydrobiologia* 34: 448-464.
 138. Moore, A. W. 1969. Azolla: biology and agronomic significance. *Bot. Rev.* 35: 17-34.
 139. Mortimer, C. H. 1941. The exchange of dissolved substances between mud and water in lakes. *J. Ecol.* 29: 280-329.
 140. ———. 1942. The exchange of dissolved substances between mud and water in lakes. *J. Ecol.* 30: 147-201.
 141. ———. 1957. Underwater "soils": a review of lake sediments. *J. Soil Sci.* 1: 63-73.
 142. Moyle, J. B. 1945. Some chemical factors influencing the distribution of aquatic plants in Minnesota. *Amer. Midl. Nat.* 34: 402-420.
 143. Mrsic, V. 1936. Lake vegetation as a possible source of forage. *Sci.* 83: 391-392.
 144. Muenscher, W. C. 1944. *Aquatic plants of the United States*. Comstock Publ. Co. Ithaca, N. Y.
 145. Mulligan, H. F. 1969. Management of aquatic vascular plants and algae, p. 464-482. *In*: *Eutrophication: Causes, Consequences, Correctives*. Nat. Acad. Sci., Washington, D. C.
 146. ——— & A. Baranowski. 1969. Growth of phytoplankton and vascular aquatic plants at different nutrient levels. *Verh. Internat. Verein. Limnol.* 17: 802-810.
 147. Nelson, J. W., H. V. Lindstrom, L. S. Palmer, W. M. Sandstrom, & A. N. Wick. 1939. Nutritive value and chemical composition of certain freshwater plants of Minnesota. *Tech. Bull. No. 136*, Univ. Minnesota Agric. Exp. Sta.
 148. Obeid, M. & M. J. Chadwick. 1964. Some factors affecting the growth of two aquatic weed species of the Nile-water hyacinth (*Eichhornia crassipes* Solms.) and water lettuce (*Pistia stratiotes* L.). *Proc. 7th Brit. Weed Control Conf.* 548-552.
 149. Odum, H. T. 1957. Primary production measurements in eleven Florida springs

- and a marine turtle-grass community. *Limnol. Oceanogr.* **2**: 85-97.
150. ——. 1957. Trophic structure and productivity of Silver Springs, Florida. *Ecol. Monogr.* **27**: 55-112.
151. Olsen, S. 1964. Phosphate equilibrium between reduced sediments and water. Laboratory experiments with radioactive phosphorus. *Verh. Internat. Verein. Limnol.* **15**: 333-341.
152. Owens, M. & R. W. Edwards. 1961. The effects of plants on river conditions. II. Further crop studies and estimates of net productivity of macrophytes in a chalk stream. *J. Ecol.* **49**: 119-126.
153. —— & ——. 1962. The effects of plants on river conditions. III. Crop studies and estimates of net productivity of macrophytes in four streams in southern England. *J. Ecol.* **50**: 157-162.
154. —— & P. J. Maris. 1964. Some factors affecting the respiration of some aquatic plants. *Hydrobiologia* **23**: 533-543.
155. —— & G. Wood. 1968. Some aspects of the eutrophication of water. *Water Res.* **2**: 151-159.
156. ——, M. A. Learner & P. J. Maris. 1967. Determination of the biomass of aquatic plants using an optical method. *J. Ecol.* **55**: 671-676.
157. Palmisano, A. W., Jr. & J. D. Newsom. 1967. Ecological factors affecting occurrence of *Scirpus olneyi* and *Scirpus robustus* in the Louisiana coastal marshes. *Ann. Conf. S. E. Game & Fish Comm.* **23**: 161-172.
158. Pearsall, W. H. & E. Gorham. 1956. Production ecology. I. Standing crop of natural vegetation. *Oikos* **7**: 193-201.
159. Peltier, W. H. & E. B. Welch. 1969. Factors affecting growth of rooted aquatics in a river. *Weed Sci.* **17**: 412-416.
160. —— & ——. 1970. Factors affecting growth of rooted aquatic plants in a reservoir. *Weed Sci.* **18**: 7-9.
161. Penfound, W. T. 1940. The biology of *Dianthera americana* L. *Amer. Midl. Nat.* **24**: 242-247.
162. ——. 1940. The biology of *Achyranthes philoxeroides* (Mart.) Standley. *Amer. Midl. Nat.* **24**: 248-252.
163. ——. 1953. The relation of plants to public health. *Econ. Bot.* **7**: 182-190.
164. ——. 1953. Plant communities of Oklahoma lakes. *Ecology* **34**: 561-583.
165. ——. 1956. Primary production of vascular aquatic plants. *Limnol. Oceanogr.* **1**: 92-101.
166. —— & T. T. Earle. 1948. The biology of the water hyacinth. *Ecol. Monogr.* **18**: 448-472.
167. ——, T. F. Hall & A. D. Hess. 1945. The spring phenology of plants in and around the reservoirs in north Alabama with particular reference to malaria control. *Ecology* **26**: 332-352.
168. Pirie, N. W. 1960. Water hyacinth: a cause or a crop? *Nature* **185**: 116.
169. ——. 1969. The alleviation of world protein shortage, p. 83-92. *In*: M. H. Briggs (ed.). *Urea as a protein supplement*. Pergamon Press, New York.
170. Pomeroy, L. R., E. E. Smith & C. M. Grant. 1965. The exchange of phosphorus between estuarine water and sediments. *Limnol. Oceanogr.* **10**: 167-172.
171. Pond, R. H. 1905. The biological relation of aquatic plants to the substratum. U.S. Comm. of Fish and Fisheries. *Comm. Rept.* **1903**: 483-526.
172. Rickett, H. W. 1922. A quantitative study of the larger aquatic plants of Lake Mendota. *Trans. Wisconsin Acad. Sci., Arts, Letters* **20**: 501-527.
173. ——. 1924. A quantitative study of the larger aquatic plants of Green Lake, Wisconsin. *Trans. Wisconsin Acad. Sci., Arts, Letters* **24**: 141-146.
174. Riemer, D. N. & S. J. Toth. 1969. A survey of the chemical composition of *Potamogeton* and *Myriophyllum* in New Jersey. *Weed Sci.* **17**: 219-223.
175. —— & ——. 1970. Chemical composition of five species of Nymphaeaceae. *Weed Sci.* **18**: 4-6.
176. Rigler, R. H. 1956. A tracer study of the phosphorus cycle in lake water. *Ecology* **37**: 550-562.
177. ——. 1964. The phosphorus fractions and turnover time of inorganic phosphorus in different types of lakes. *Limnol. Oceanogr.* **9**: 511-518.
178. Sahai, R. & A. B. Saha. 1969. Contribution to the ecology of Indian aquatics I. Seasonal changes in biomass of water hyacinths [*Eichhornia crassipes* (Mart.) Solms]. *Hydrobiologia* **35**: 376-382.
179. Sawyer, C. N. 1962. Causes, effects, and control of aquatic growths. *J. Water Poll. Control Fed.* **34**: 279-288.
180. ——. 1966. Basic concepts of eutrophication. *J. Water Poll. Control Fed.* **38**: 737-744.
181. Schelpe, E. A. C. L. E. 1961. The ecology of *Salvinia auriculata* and associated

- vegetation on Kariba Lake. *J. South African Bot.* **27**: 181-187.
182. Schomer, H. A. 1934. Photosynthesis of water plants at various depths in the lakes of northeastern Wisconsin. *Ecology* **15**: 217-218.
183. Schuette, H. A. & Alice E. Hoffman. 1921. Notes on the chemical composition of some of the large aquatic plants of Lake Mendota. I. *Cladophora* and *Myriophyllum*. *Trans. Wisconsin Acad. Sci., Arts, and Letters* **20**: 529-531.
184. — & H. Alder. 1927. Notes on the chemical composition of the larger aquatic plants of Lake Mendota. II. *Vallisneria* and *Potamogeton*. *Trans. Wisconsin Acad. Sci., Arts, and Letters* **23**: 249-254.
185. — & —. 1929. A note on the chemical composition of *Chara* from Green Lake, Wisconsin. *Trans. Wisconsin Acad. Sci., Arts, and Letters* **24**: 141-146.
186. — & —. 1929. Notes on the chemical composition of some of the larger aquatic plants of Lake Mendota. III. *Castalia odorata* and *Najas flexilis*. *Trans. Wisconsin Acad. Sci., Arts, and Letters* **24**: 135-140.
187. Schulthorpe, C. D. 1967. The biology of aquatic vascular plants. Edward Arnold (Publishers) Ltd., London.
188. Seddon, B. 1965. Occurrence of *Isoetes echinospora* in eutrophic lakes in Wales. *Ecology* **46**: 747-748.
189. —. 1967. The lacustrine environment in relation to macrophytic vegetation, p. 205-215. *In*: E. J. Cushing & H. E. Wright, Jr. (eds.). *Quaternary Paleocology*. Yale Univ. Press, New Haven.
190. Shannon, E. L. 1953. The production of root hairs by aquatic plants. *Amer. Midl. Nat.* **50**: 474-479.
191. Singh, S. B. 1962. Preliminary experiments on the relative manurial values of some aquatic weeds as composts. *Proc. 10th Session Indo-Pacific Fisheries Council, Seoul*: 141-145.
192. Smith, G. E., T. F. Hall & R. A. Standley. 1967. Eurasian water-milfoil in the Tennessee Valley. *Weeds* **15**: 95-98.
193. Spence, D. H. N. 1964. The macrophytic vegetation of freshwater lochs, swamps and associated fens, p. 306-425. *In*: J. H. Burnett (ed.). *The Vegetation of Scotland*. Oliver and Boyd, London.
194. —. 1967. Factors controlling the distribution of freshwater macrophytes with particular reference to the lochs of Scotland. *J. Ecol.* **55**: 147-170.
195. Stake, E. 1967. Higher vegetation and nitrogen in a rivulet in central Sweden. *Schweiz. Z. Hydrol.* **29**: 107-124.
196. —. 1968. Higher vegetation and phosphorus in a small stream in central Sweden. *Schweiz. Z. Hydrol.* **30**: 353-373.
197. Steemann Nielsen, E. 1944. Dependence of freshwater plants on quantity of carbon dioxide and hydrogen ion concentration. *Dansk. Bot. Ark.* **11**: 1-25.
198. —. 1946. Carbon sources in the photosynthesis of aquatic plants. *Nature* **158**: 594-596.
199. —. 1947. Photosynthesis of aquatic plants with special reference to the carbon sources. *Dansk. Bot. Ark.* **12**: 1-71.
200. Steward, K. K. 1970. Nutrient removal potentials of various aquatic plants. *Hyacinth Control J.* **8**: 34-35.
201. Straškraba, M. 1963. Share of the littoral region in the productivity of two fishponds in southern Bohemia. *Rozpravy ČSAV, řada MPV* **73**: 1-63.
202. —. 1968. Der Anteil der höheren Pflanzen an der Produktion der stehenden Gewässer. *Mitt. Internat. Verein. Limnol.* **14**: 212-230.
203. Swindale, D. N. & J. T. Curtis. 1957. Phytosociology of the larger submerged plants in Wisconsin Lakes. *Ecology* **38**: 397-407.
204. Szumiec, J. 1963. The influence of emergent vegetation and the manner of its mowing on the bottom fauna of fish ponds. *Acta Hydrobiol.* **5**: 315-335.
205. Szczepański, A. 1969. Biomass of underground parts of the reed *Phragmites communis* Trin. *Bull. Acad. Pol. Sci.* **17**: 245-247.
206. Taylor, K. G. & R. C. Robbins. 1968. The amino acid composition of water hyacinth (*Eichhornia crassipes*) and its value as a protein supplement. *Hyacinth Control J.* **8**: 24-25.
207. Teal, J. M. 1962. Energy flow in the salt marsh ecosystem of Georgia. *Ecology* **43**: 614-624.
208. — & J. W. Kanwisher. 1966. Gas transport in the marsh grass, *Spartina alterniflora*. *J. Exp. Bot.* **17**: 355-361.
209. Timmer, C. E. & L. W. Weldon. 1967. Evapotranspiration and pollution of water by water hyacinth. *Hyacinth Control J.* **6**: 34-37.
210. Udell, H. F., J. Zarudsky, T. E. Doheny & P. R. Burkholder. 1969. Productivity and nutrient value of plants growing in the salt marshes of the town of

- Hempstead, Long Island. Bull. Torrey Bot. Club **96**: 42-51.
211. Vaidya, B. S. 1967. Study of some environmental factors affecting the occurrence of charophytes in Western India. *Hydrobiologica* **29**: 256-262.
212. Weldon, L. W. & R. D. Blackburn. 1962. Identification of common aquatic weeds. *Hyacinth Control J.* **1**: 32-37.
213. —, — & D. S. Harrison. 1969. Common aquatic weeds. U.S. Dept. Agric., Agric. Handbook No. 352. U.S. Gov. Printing Office, Washington, D.C.
214. Westlake, D. F. 1963. Comparisons of plant productivity. *Biol. Rev.* **38**: 385-425.
215. —. 1965. Theoretical aspects of the comparability of productivity data, p. 315-322. *In*: C. R. Goldman (ed.), Primary Productivity in Aquatic Environments. Mem. Ist. Ital. Idrobiol., 18 Suppl., Univ. California Press, Berkeley.
216. —. 1965. Some basic data for investigations of the productivity of aquatic macrophytes, p. 229-248. *In*: C. R. Goldman (ed.), Primary Productivity in Aquatic Environments. Mem. Ist. Ital. Idrobiol., 18 Suppl., Univ. California Press, Berkeley.
217. —. 1966. A model for quantitative studies of photosynthesis by higher plants in streams. *Int. J. Air Water Poll.* **10**: 883-896.
218. —. 1966. The biomass and productivity of *Glyceria maxima*. I. Seasonal changes in biomass. *J. Ecol.* **54**: 745-753.
219. —. 1967. Some effects of low-velocity currents on the metabolism of aquatic macrophytes. *J. Exp. Bot.* **18**: 187-205.
220. —. 1968. The biology of aquatic weeds in relation to their management. Proc. 9th Brit. Weed Control Conf. 372-379.
221. Wetzel, R. G. 1960. Marl encrustations on hydrophytes in several Michigan lakes. *Oikos* **11**: 223-236.
222. —. 1964. A comparative study of the primary productivity of higher aquatic plants, periphyton, and phytoplankton in a large shallow lake. *Int. Revue ges. Hydrobiol.* **49**: 1-61.
223. —. 1969. Factors influencing photosynthesis and excretion of dissolved organic matter by aquatic macrophytes in hard-water lakes. *Verh. Internat. Verein. Limnol.* **17**: 72-85.
224. —. 1969. Excretion of dissolved organic compounds by aquatic macrophytes. *Bioscience* **19**: 539-540.
225. — & D. L. McGregor. 1968. Axenic culture and nutritional studies of aquatic macrophytes. *Amer. Midl. Nat.* **80**: 52-64.
226. Williams, J. D. H., J. K. Syers, R. F. Harris & D. E. Armstrong. 1970. Adsorption and desorption of inorganic phosphorus by lake sediments in a 0.1 M NaCl system. *Environ. Sci. and Tech.* **4**: 517-519.
227. Wilson, K. 1947. Water movement in submerged aquatic plants, with special reference to cut shoots of *Ranunculus fluitans*. *Ann. Bot.* **11**: 91-122.
228. Wilson, L. R. 1939. Rooted aquatic plants and their relation to the limnology of fresh-water lakes, p. 107-122. *In*: Problems of Lake Biology. Publication Amer. Assoc. Adv. Sci. No. 10.
229. Winter, H. 1961. The uptake of cations by *Vallisneria* leaves. *Acta Bot. Neerl.* **10**: 341-393.
230. Yeo, R. R. 1964. Life history of common cut-tail. *Weeds* **12**: 284-288.
231. —. 1965. Life history of sago pondweed. *Weeds* **13**: 314-321.
232. Yount, J. L. 1964. Aquatic nutrient reduction-potential and possible methods. Rep. 35th Ann. Meeting, Florida Anti-Mosquito Assoc., p. 83-85.
233. — & R. A. Crossman, Jr. 1970. Eutrophication control by plant harvesting. *J. Water Poll. Control Fed.* **42**: 173-183.

Subject matter represented by these references can be divided into seven categories. To facilitate utility of this bibliography, each reference in Appendix I is listed (and cross-referenced) according to the appropriate subject matter.

I. Chemical composition and nutritive value

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