Northeast Gulf Science

Volume 4
Number 1 *Number 1*

Article 5

9-1980

Changes in the Submerged Macrophytes of Lake Pontchartrain (Louisiana): 1954-1973

R. Eugene Turner
Louisiana State University

Rezneat M. Darnell
Texas A&M University

Judy Bond
Louisiana State University

DOI: 10.18785/negs.0401.05

CHANGES IN THE SUBMERGED MACROPHYTES OF LAKE PONTCHARTRAIN (LOUISIANA): 1954-1973.

An estimated 27% of U.S. estuaries remain in a relatively natural condition (National Estuary Survey, 1970). Clearcut documentation of the changes, however, is rare due to the scarcity of adequate surveys prior to potentially destructive influences.

During 1953-1955 an extensive ecological survey was carried out on Lake Pontchartrain, Louisiana, a large (2.4 x 10^5 ha), shallow (average depth 4 m), estuarine lake (1-15 ‰). The primary focus was the ecology of the open waters of the lake (e.g. Suttkus *et al.,* 1954; Darnell, 1958, 1961, and 1964). However, attention was also given to the ecology of the littoral zone, and most of this information has not previously been published. Of special interest here is information obtained on the distribution of submerged beds of rooted vegetation, which we compare to that of Montz's (1978) similar 1973 survey.

MATERIALS AND METHODS

Data were derived from intensive surveys in the vicinity of the regular shore seining stations as well as from a special trip around the periphery of the lake, from 0-3 m depth, during the summer of 1954 for the purpose of mapping the distribution of the vegetation beds. This survey was carried out by towing a weed sampler (Figure 1) behind the shallow draft vessel. This equipment was retrieved every few minutes to determine if a bed had been encountered. When the sampler captured vegetation, the area was examined by wading (where possible) and by hand collecting to determine the extent and species composition of the vegetation. All plant identifications were made by

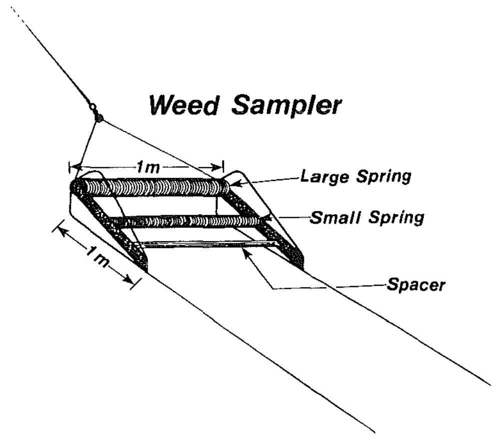


Figure 1. The sampling gear used to collect submerged macrophytes in 1954. Two springs, of 1/2" and 1/4" spacing, are mounted on a sled which is towed by a small boat.

Joseph Ewan of the Biology Department, Tulane University. The 1954 survey was relatively complete for the periphery of the lake except for the western shore from Ruddock to the Tangipahoa River and for the southeastern shore from South Point to the Rigolets (see Figure 2). In these areas we mapped the presence of the most common plants and compared it to Montz's (1978) maps, which were also based on an extensive summer survey.

From the salinity records maintained by the U.S. Army Corps of Engineers for a station at Little Woods, La., on the southeast lakeshore, a 5-year running average over the period 1954-1973 was obtained. This was compared to the stream discharge of a representative tributary, the Tangipahoa River at Robert, La., for the same 5-year period.

The land-use maps of the U.S. Geological Survey were examined to compare changes from 1954 to 1975 in the immediate vicinity of the lake.

RESULTS

The only submerged grasses found in

the lake in 1954 were *Ruppia maritima* and *Vallisneria americana.* There was an apparent decline in the abundance of these two species from 1954 to 1973 (Figure 2). Much of the loss occurred in the vicinity of the New Orleans beachfront and near the entrance to the estuary. Small patches of these macrophytes occurred in 1973 near the Tchefuncta River where there had been none before. Though it is not possible to precisely compare our findings with Montz's because of the subjective estimations for occurrence of the plants, it is worth noting that he observed the "infrequent" occurrence of plants along the southern shore where we observed them to be "abundant" in 1954. The net result is an apparent decrease of these two species along the shoreline from 1954 to 1973 which amounts to a 25-33% reduction. Other differences are that Montz (1978) found *Najas guadalupensis* where none were located in 1954. This may reflect a real change in distribution. However, Montz described *Najas* sp. as "infrequent" in water less than 30 cm depth so we may have missed them in the 1954 survey. *Potamogeton perfoliatus* was found to be abundant in 1973 but not found at all in 1954 in an area which we feel was surveyed adequately then. *Potamogeton perfoliatus* was collected in 1943 by C. A. Brown in the lake at Mandeville, La. (Haynes, 1968).

The salinity of the lake, as represented by the changing salinity at Little Woods, was similar or lower in 1954 than in 1973 (Figure 3). The annual variations in salinity reflect annual variations in riverflow.

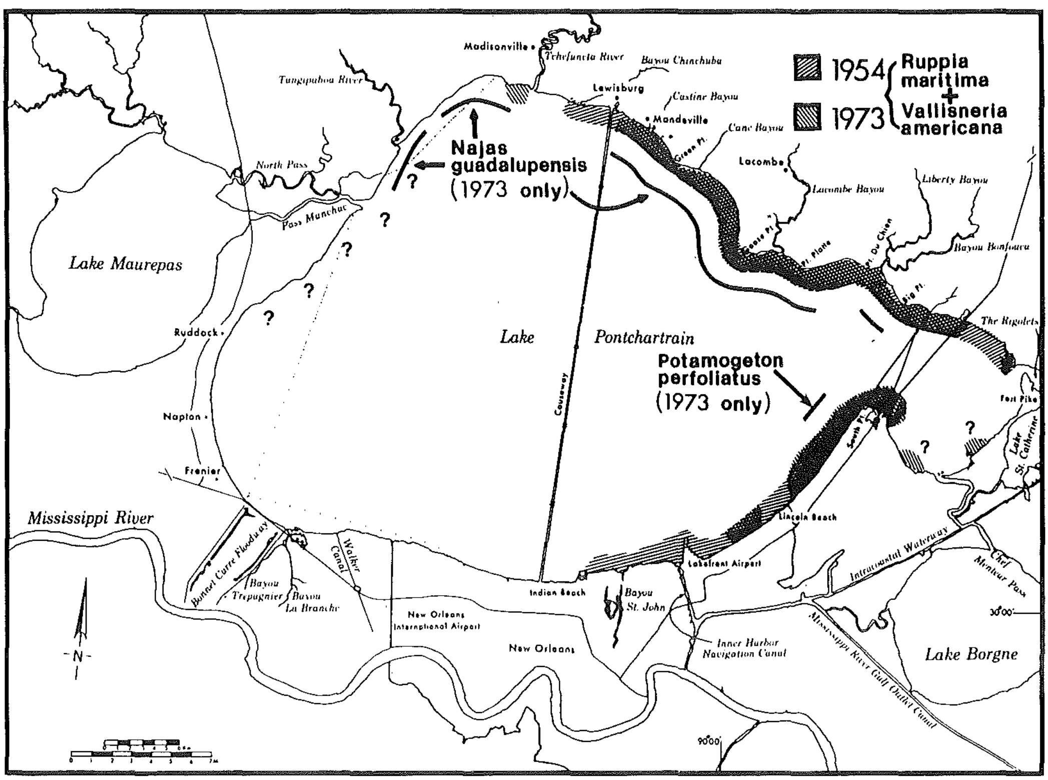


Figure 2. The distribution of grassbeds along the shoreline of Lake Pontchartrain in 1954 as compared to 1973. The question marks (??) represent areas that were not sampled in 1953-54. The width of the shaded area is arbitrary; total area is not shown.

The land-use patterns in the immediate vicinity of the lake have changed tremendously with the growth of New Orleans (Figure 4). Thousands of acres of wetlands have been filled or leveed for agriculture or urban expansion; numerous channels were built to drain water pumped from the city up to sea level and into the lake. At one time there were vast areas of grassbeds behind the present New Orleans sea wall on the lakefront, especially in the recently urbanized area (P. Viosca, pers. comm.). Further urban expansion has occurred on the north shore near Mandeville, Madisonville and Slidell. We estimate that urban areas in 1974 compared to 1954 are three times and eight times greater on the south and north shore, respectively. There were few changes in the types and quantities of land-use within the whole watershed, except for the growth of Baton Rouge to the northwest. The major decline in vegetation is where urban growth has occurred.

DISCUSSION

Indications are that some rooted aquatics plants have expanded their range while others decreased or disappeared in areas. Perret *et al.* (1971) mentioned *Ruppia* sp. and *Valisneria* sp. as the only "abundant" species in Lake Pontchartrain during their 1968-1970 survey. Montz (1978) noted that their earlier survey indicated ten times more acreage of rooted aquatics present than he found.

We cannot clearly identify the specific causal agent(s) of these changes. Some adjustments to rising salinities may have occurred. For example, on the southshore a saltwater source, the Mississippi River Gulf Outlet, was connected to the Inner Harbor Navigation Canal between surveys in the same vicinity where the grassbeds are no longer evident. There may have been a contraction or expansion of the grassbeds on the eastern edge near the other saltwater source, The Rigolets,

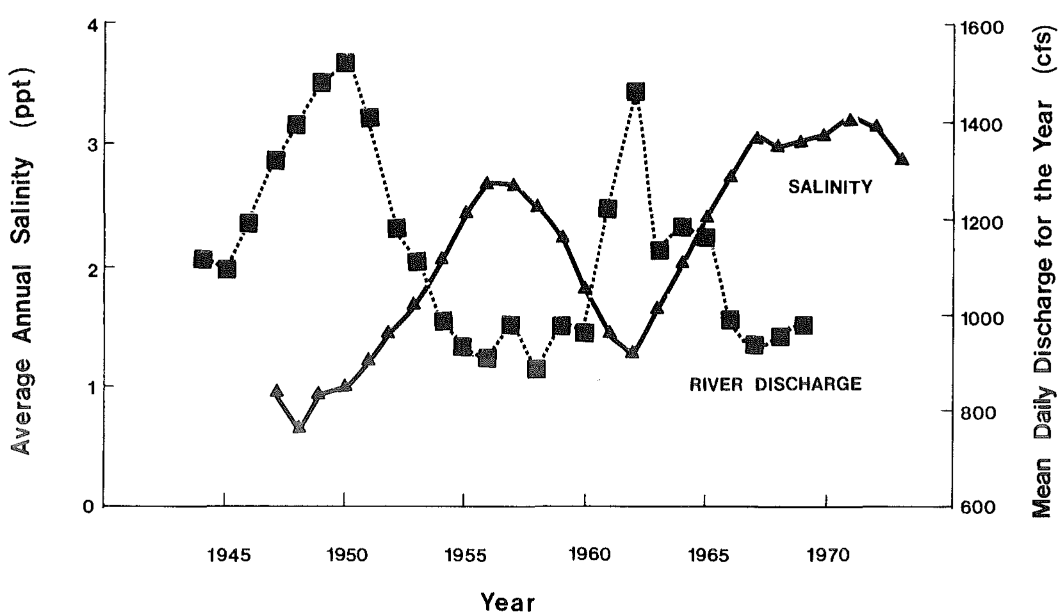
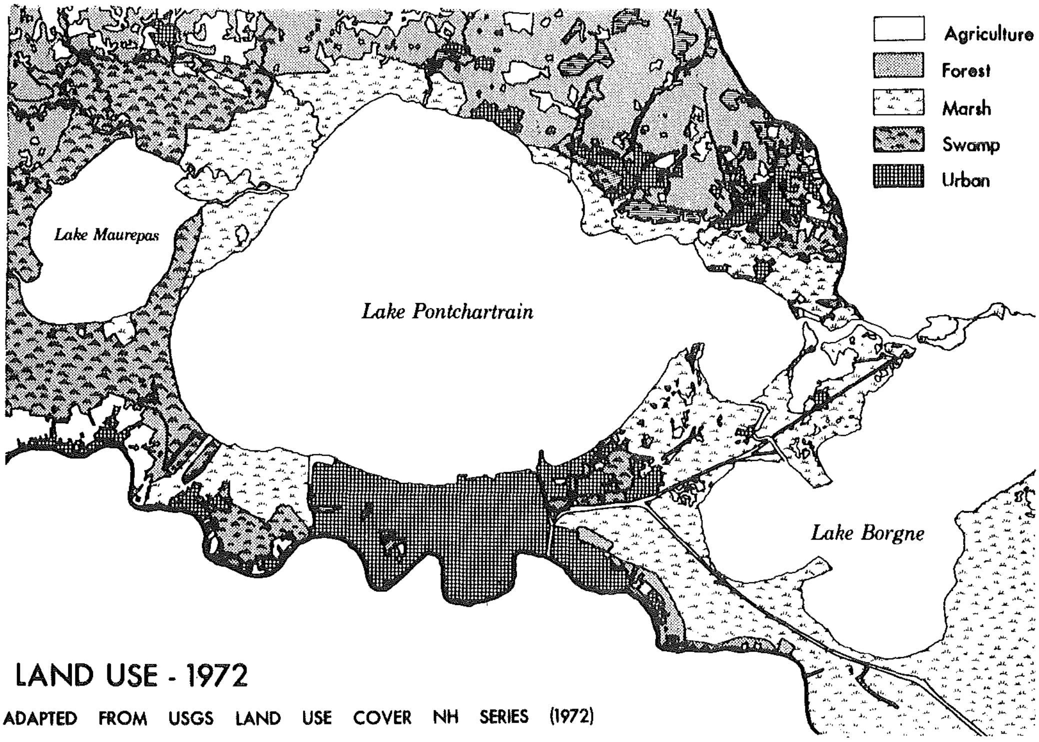


Figure 3. The lake salinity at Little Woods, La. and the river discharge of the Tangipahoa River at Robert, La.



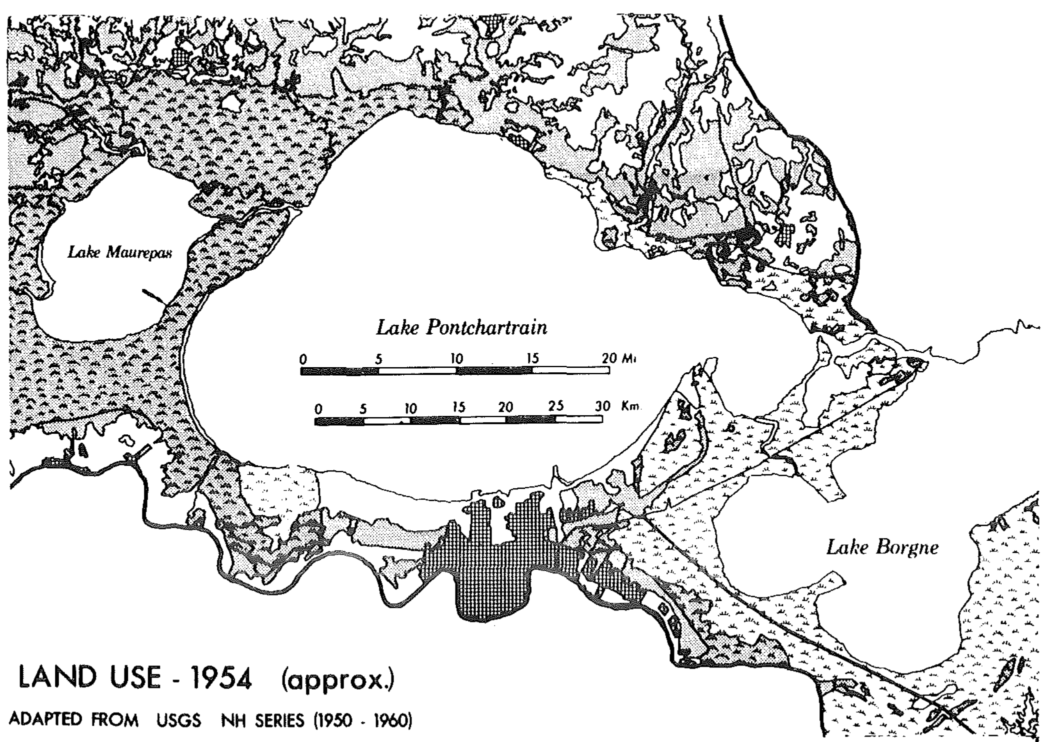


Figure 4. Land-use in the vicinity of Lake Pontchartrain in 1954 (lower figure) and in 1972 (upper figure).

DOI: 10.18785/negs.0401.05

but this could not be determined since the area was not surveyed in 1954. It was surveyed along the eastern end of the northern shoreline where there was a decrease. There was also a loss at the western edge of the northern shore boundary away from all saltwater sources. All of these same areas of loss are also adjacent to areas of recent urban expansion. Bayley *et al.* (1978) postulated that the recent changes in submerged macrophyte communities of Chesapeake Bay were related to eutrophication, salinization and increases in turbidity that were caused by urbanization and agricultural activities. However, the area of agricultural lands in the Lake Pontchartrain watershed has increased from 1954 to 1972. Lake nutrient concentrations near New Orleans (unpublished data) are much higher nearshore than a few km offshore primarily because of the open urban sewers and canals which empty there from the city. Herbicides, pesticides predator control and chlorine may also be detrimental to the growth of submerged macrophytes (Stevenson and Confer, 1978; Mann, 1973).

There are no comprehensive studies of these Louisiana ecosystems comparable to those on *Zostera* sp. (McRoy, 1966) or *Thalassia* sp. (Zieman, 1968). In general, submerged macrophyte communities act as a direct food source for some large predators and as an indirect source for many. Additionally, macrophyte communities act as geological agents (Schubel, 1973). We therefore believe there is cause for concern about these changes in Lake Pontchartrain and that if the data had been collected, the effect could be further documented by past changes in the commercial fisheries harvest, the local geology within the grassbeds, waterfowl feeding behavior and the nutrient chemistry of the water.

ACKNOWLEDGMENTS

We thank our colleagues in the Coastal Ecology Laboratory, Center for Wetland Resources, Louisiana State University, the Louisiana Dept. of Wildlife and Fisheries for support of the 1953-1955 study of Lake Pontchartrain, one unidentified reviewer, and Dr. Montz for reviewing this manuscript. This work was supported by a grant from the Corps of Engineers and by the Louisiana Sea Grant Program, a part of the National Sea Grant Program, maintained by the National Oceanic and Atmospheric Administration, U.S. Dept. of Commerce. The U.S. Government is authorized to produce and distribute reprints for governmental purposes notwithstanding any copyright notation that may appear hereon. Coastal Ecology Laboratory Publ. No. LSU-CEL-79-01.

LITERATURE CITED

Bayley, S., V. D. Stotts, P. F. Springer and J. Steenis. 1978. Changes in submerged aquatic macrophyte populations at the head of Chesapeake Bay, 1958-1975. Estuaries 1:171-182.

Darnell, R. M. 1958. Food habits of fishes and larger invertebrates of Lake Pontchartrain, Louisiana, as estuarine community. Publ. Inst. Mar. Sci., Univ. Texas 5:353-416.

__________. 1961. Trophic spectrum of an estuarine community, based on Lake Pontchartrain, Louisiana. Ecology 42:553-568.

__________. 1964. Organic detritus in relation to secondary production in aquatic communities. Verh. Int. Verein. Limnol. 15:462-470.

Haynes, R. R. 1968. *Potamogeton* in Louisiana. Proc. La. Acad. Sci. 31:82-90.

Mann, K. H. 1973. Seaweeds: Their productivity and strategy for growth. Sci.

182:975-981.

McRoy, C. P. 1966. The standing stock and ecology of eelgrass, *Zostera marina,* Izembek Lagoon, Alaska. M.S. thesis, Univ. Wash., Seattle. 138 pp.

Montz, G. N. 1978. The submerged vegetation of Lake Pontchartrain, La. Castanea 43-115-128.

National Estuary Study. 1970. U.S. Department of the Interior, Vol. 1, Fish and Wildlife Service.

Perrett, W., B. Barrett, W. Latapie, J. Pollard, W. Mock, G. Adkins, W. Gaidry, and C. White. 1971. Cooperative Gulf of Mexico Estuarine Inventory and Study, Louisiana, Phase 1. Area Description. Louisiana Wildlife and Fisheries Commission, New Orleans.

Schubel, J. R. 1973. Some comments on seagrasses and sedimentary processes. Chesapeake Bay Institute Spec. Rept. No. 33. 32 pp.

Stevenson, J. C., and N. M. Confer. 1978. Summary of available information on Chesapeake Bay submerged vegetation. U.S. Fish and Wildlife Serv. Publ. FWS/OBS — 78/66. U.S. Dept. Interior, Washington, D.C. 335 pp.

Suttkus, R., R. Darnell and J. Darnell. 1954. Biological study of Lake Pontchartrain, Louisiana. Tulane University. Unpublished manuscript.

Zieman, J. C. 1968. A study of the growth and decomposition of the seagrass, *Thalassia testudinum.* M.S. thesis, Univ. Miami. 50 pp.

R. Eugene Turner. *Center for Wetland Resources, Louisiana State University, Baton Rouge, LA 70808.*

Rezneat M. Darnell. *Department of Oceanography, Texas A&M University, College Station, TX 77843.*

Judy Bond. *Center for Wetland Resources, Louisiana State University, Baton Rouge, LA 70808.*

FIRST RECORD OF THE SEA LAMPREY, *Petromyzon marinus L.*, IN THE GULF OF MEXICO

The sea lamprey, *Petromyzon marinus,* has a very wide distribution, occurring throughout western Europe, North Africa (Algeria) and along the Atlantic drainages of North America. However in North America it was reported only as far south as northern Florida (Bigelow and Schroeder, 1948; Potter and Beamish, 1977).

In the present note we are reporting an extension of the known range of this species into the Gulf of Mexico. The record is based on a single specimen received on loan from the National Museum of Natural History, Smithsonian Institution, Washington, D.C.

Collection details are as follows:

Locality — Cape San Blas, tidal pond near point, Florida, Gulf of Mexico basin.
Date — June 20, 1932.
Collector— Issac Ginsburg

In order to verify this record Janet R. Gomon, Museum Specialist, Division of Fishes, Smithsonian Institution, checked their ichthyological files and confirmed that Isaac Ginsburg worked in the Gulf of Mexico for the Fish and Wildlife Service during the time in question. Dr. Lachner, also of the Smithsonian Institution recalls that Ginsburg worked with Gordon Gunter in the Gulf region.

The specimen, 136 mm in total length, had almost completed metamorphosis, but did not reach macrophthalmia stage, as yet. The fimbriae on the anterior margin of the disc were poorly developed and teeth were not cornified though could be counted.

Body proportions, expressed as a percentage of total length (after Vladykov and Follett, 1965) are as follows: prebranchial length 11.8; branchial length 8.1;