



ADDRESS ONLY THE  
REGIONAL DIRECTOR

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
FISH AND WILDLIFE SERVICE  
BUREAU OF SPORT FISHERIES AND WILDLIFE  
PEACHTREE-SEVENTH BUILDING  
ATLANTA 23, GEORGIA

SOUTHEAST REGION

• (REGION 4)  
NORTH CAROLINA  
SOUTH CAROLINA  
GEORGIA  
FLORIDA  
KENTUCKY  
TENNESSEE  
ALABAMA  
MISSISSIPPI  
ARKANSAS  
LOUISIANA  
VIRGINIA  
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PUERTO RICO  
VIRGIN ISLANDS

March 13, 1962

CE-IM-po (Lake Pont-  
chartrain, Louisiana)

District Engineer  
U. S. Army, Corps of Engineers  
New Orleans, Louisiana

Dear Sir:

Pursuant to the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.), the U. S. Fish and Wildlife Service, in cooperation with the Louisiana Wild Life and Fisheries Commission, has examined the fish and wildlife aspects of Lake Pontchartrain and vicinity, Louisiana, in relation to proposed plans for hurricane protection under consideration by your agency. This is a letter report of our findings, submitted for inclusion in your survey report.

In addition to presenting the relation of fish and wildlife requirements to your plans for hurricane protection, this report considers the project-associated probability of salt-water intrusion into the lake via the Mississippi River-Gulf Outlet channel, a navigation project currently under construction by your agency.

Report findings are based on intensive fish and wildlife investigations in both the primary project and the Mississippi River-Gulf Outlet project areas. Where appropriate, the resource appraisals were coordinated with model studies conducted by the Waterways Experiment Station, Vicksburg, Mississippi. The model study limitations are recognized, but for reporting purposes, the study data have been used as furnished.

Frequent coordination meetings between this Service, your staff, and the Louisiana Wild Life and Fisheries Commission have been of invaluable assistance in directing the scope and approach of the field investigations as well as use and interpretation of the model study data.

DESCRIPTION OF THE AREA

Lake Pontchartrain is a shallow (14-foot average depth) 640 square-mile tidal basin bordered on its south side by the New Orleans metropolitan locale. It is important to note the lake is only a part of the total interrelated estuarine environmental complex of

this southeastern Louisiana coastal area. Likewise, it must be recognized that changes effected in the lake can result in changes within other segments of the complex. Accordingly, certain major factors that influence the final appreciation of the total fresh and saline contributions to the lake require explanation.

Lake Pontchartrain lies between the relatively salt water conditions of Lake Borgne and Mississippi Sound and the relatively fresh water conditions of Lake Maurepas. Local residents generally consider the lake to be fresh water west of the Lake Pontchartrain Causeway and salt water east of this division line. The upper or westward half of the lake has average annual salinities of about 1-2 p.p.t. in comparison to the  $1\frac{1}{2}$ - $4\frac{1}{2}$  p.p.t. obtained in the lower half of the area. It is, of course, recognized that this division line or salinity gradient varies as the result of influx from either of the contributing systems.

### Saline Waters

The transport of salt water into Lake Pontchartrain is currently accomplished through the Chef Menteur and Rigolets passages by Lunar and wind tides. These are natural passes, having average widths of about 1,000 feet and 3,500 feet, and controlling depths of 25 feet and 20 feet in the Chef Menteur and Rigolets channels, respectively.

The normal flow through the passes results from tidal head differential developed between Lake Pontchartrain and Lake Borgne-Mississippi Sound. Wind affects normal tidal exchange considerably, and at times wind tides are dominant. Easterly winds increase inflow through the passes, and at times, depending on source values, salinity. The salinities of sourcewaters of Lake Borgne and Mississippi Sound are subject to considerable variation caused by discharges from Pearl River.

The Mississippi River-Gulf Outlet navigation channel may have equal or greater importance than the natural passes for transporting saline waters to Lake Pontchartrain. This 36-foot deep, 500-foot bottom width channel, when completed, will afford a more direct connection between Lake Pontchartrain and the Gulf of Mexico. The controlling depth of this system will be the 30-foot deep Industrial Canal. Gulf waters entering the lake through this system would have salinities several times higher than waters entering through the natural passes.

### Fresh Water

The normal fresh water contributions arise from direct rainfall and runoff into both Lake Pontchartrain and Lake Maurepas. An atypical

freshwater source is the Bonnet Carre Floodway, a floodwater outlet designed to bypass certain Mississippi River flood stages through Lake Pontchartrain. Operation of this system has been required only three times in its 27 years of existence.

#### DESCRIPTION OF THE PROJECT

Two basic plans of hurricane protection have been studied (Plate 1).

##### Low Level Plan

The low level plan provides for a system of levees on the south lakeshore adjacent to the New Orleans metropolitan area and a barrier across the east lakeshore with control structures in the two tidal passes. A structure or lock would also be included at the junction of Industrial Canal and Lake Pontchartrain.

Structures would reduce the cross sectional area of each tidal pass 75 percent. Sills would be at the present controlling depth of the passes (minus 25 feet in Chef Menteur and minus 20 feet in the Rigolets) and closure would be accomplished with tainter gates. Navigation locks would pass boat traffic around each structure. Gates would be closed only when a hurricane was approaching the Louisiana coast, and reopened when danger was past. Hurricanes strike the Louisiana coast an average of 1.6 times a year between spring and fall. Model tests of the operation were based on a maximum closure of two weeks.

##### High Level Plan

The high level plan does not include the barrier along the eastern lakeshore which incorporates control structures in the tidal passes or the structure in the Gulf Outlet connection. In most other respects the two plans are similar, except that higher levees would be required along the south lakeshore.

Under either plan drainage facilities would be included in the levee system. Control gates in the drains from the marshes and swamp immediately east of Bonnet Carre spillway would remain open except when closure would be required to prevent hurricane flooding. The levee portion of either plan would not necessarily be provided over the entire project area, but could be adapted as separate units, protecting those parishes giving the required local project assurances and participation.

#### FISH AND WILDLIFE RESOURCES

Lake Pontchartrain, with its salinity gradient, sustains an important fishery resource. Ninety-five percent of the sport fishing

harvest and 90 percent of the commercial fishery production are marine species. Bait sales of live and dead shrimp, live small fish, crabs, and clams to supply fisherman needs in the immediate Lake Pontchartrain area amount to 1/4 million dollars annually. With maintenance of existing salinities a without-the-project use of 800,000 man-days of sport fishing and sport and commercial fishery harvest of 5-1/4 million pounds of fish and shellfish are assignable to the lake.

While all of Lake Pontchartrain is considered a nursery area, the nursery value of the upper lake is of exceptional importance to such species as menhaden and white shrimp. These nursery stocks, in addition to contributing to the harvest elsewhere when they mature, also provide forage (food) for desirable sport and commercial fish species in the lower lake.

Since it is evident that the fishery complex is intimately related to the salinity gradient, it must be emphasized that a major change or shift in the salinity gradient could have significant effect upon the fishery resources both in the lake and adjacent areas. Both the harvest area of the lower lake and the valuable nursery area of the upper lake are related to the existing salinity gradient. Lowering lake salinity could reduce the area of marine fishery harvest. A significant salinity increase could reduce the nursery area value, and, indirectly, the harvest.

Wildlife of significant value is present in the area, primarily waterfowl and fur animals; however, considering the metropolitan expansion without the project, significant project-occasioned losses are not assignable to this resource.

## EFFECTS OF THE PROJECT

### Levees

Levee construction included in either plan for hurricane protection is not expected to affect fish and wildlife resources directly. Indirectly, both plans would hasten urbanization and industrialization of valuable marshes by providing basic features for further flood protection and reclamation. This applies especially to the area of marsh and swamp east of Bonnet Carre Spillway that now does not have levee protection.

Since the high level plan consists essentially of levee protection, it is not expected that significant project effects would occur. In contrast, the low level plan contains other features that must be considered; namely, the control structures in the tidal passes and in the Industrial Canal connecting the Gulf Outlet with Lake Pontchartrain.

### Structures in the Tidal Passes

The principal factor considered in project investigations was the possible adverse effect of reducing the tidal volume exchange between Lake Pontchartrain and the brackish waters of Mississippi Sound-Lake Borgne by restricting the tidal passes with control structures. Of particular concern was the relation of tidal volume exchange to salinity, inasmuch as the salinity gradient in Lake Pontchartrain is dependent upon tidal introduction of brackish waters. Effect of project structures in the passes on velocity of flow and as a physical obstruction was also considered but is not believed to be significant to fish and wildlife.

Salinities were not altered significantly in model tests when the respective cross-sectional areas of the tidal passes were reduced by 75 percent. Existing salinities in Lakes Maurepas, Pontchartrain, and Borgne, under the range of inflow or salinity conditions tested, were virtually unaffected. It was also shown that the structures would not alter, to an appreciable degree, salinities which may occur in the lake system with the Gulf Outlet project completed. The model tests indicated that severe salt water intrusion into Lake Pontchartrain would occur as a result of high salinities entering the lake via Gulf Outlet channel (Fig. 1 and 3).

Salinity control was shown to be possible by placement of a structure at the junction of Lake Pontchartrain and Industrial Canal. Operation of this structure accomplished control of salt water intrusion into the lake system of the test models. Structures in the tidal passes did not interfere with this control. Figure 1 summarizes model test results showing effect of control structures in the tidal passes on existing Lake Pontchartrain salinity, effect of salt water intrusion via Gulf Outlet channel, and salt water intrusion control.

Structure closure for a period of two weeks did not alter, significantly, salinities, as modified by the Gulf Outlet channel, in Lakes Maurepas, Pontchartrain, or Borgne. Salinities in the Gulf Outlet channel increased significantly during the closure period, but were reduced upon reopening the structures by evacuation from Lake Pontchartrain of accumulated hurricane rainfall (Figure 2). Prolonged or permanent closure of the structure in the Gulf Outlet connection could have extremely adverse effects upon the Gulf Outlet channel area.

### Other Hydrological Factors

While model studies indicate that structures in the tidal passes would not affect salinity adversely, the structures would increase

velocities locally in the passes. Increased velocities could present a hazard to small boats, and locking around the structures, when required, could delay passage in and out of the lake. This delay may be a problem for boats entering the lake ahead of a hurricane. In addition, while the structures could possibly interfere with movement of fish and shellfish in and out of the lake, it appears that maintenance of the controlling depth of the passes would tend to overcome this problem.

#### DISCUSSION AND CONCLUSIONS

The Service has appraised the two plans you have under consideration for control of hurricane surges in Lake Pontchartrain. The plans consist: one, of a high levee protection for certain areas adjacent to the lake; and two, of a combination of lesser degree of levee protection combined with control structures in Chef Menteur and Rigolets passes and a structure located at the junction of the Industrial Canal and the lake.

The determination of project-occasioned changes under either plan are based primarily on model studies and data obtained from investigations conducted on the Mississippi River-Gulf Outlet Navigation project.

Lake Pontchartrain is a segment of the total estuarine environmental complex of the Southeast Louisiana coastal zone. This particular zone, which includes the total gradient between fresh and Gulf of Mexico saline waters, results from conditions maintained by both the water sources contributing to the complex.

In consequence, alteration of any segment of the complex will result in changes in other areas within the complex.

In model studies existing lake salinities were not altered significantly by control structures in Chef Menteur and Rigolets passes. The structures could result in higher flow velocities through the passes with the associated problems to boats. Also, the probability of delay of boat entry into the lake during the period of an approaching hurricane does require attention.

Model tests also established that intrusion of waters from the Mississippi River-Gulf Outlet channel through the Industrial Canal into Lake Pontchartrain, if not controlled, would result in increased salinity conditions within the lake, as well as higher salinities in the Gulf Outlet channel and adjacent areas. Opportunities to control salt water intrusion in the lake and to some degree reduce the extent of intrusion within the navigation channel appear feasible (Figures 3 and 4). Further Service studies are

being conducted to determine intrusion characteristics and to define design and operational requirements for a control structure. The Service studies will be coordinated with your efforts. In this regard, it appears further model studies or hydrological investigations conducted by your agency merit correlation with our proposed investigations.

The Service concludes that the hurricane protection, essentially by means of levee construction (High Level Plan), would have no significant detrimental effects to the fish and wildlife resources within the area of project influence. Model study findings on the low level plan indicate the two proposed control structures in the natural passes would not significantly alter the salinity gradient in Lake Pontchartrain. The model studies did establish that salt water intrusion problem through the Mississippi River-Gulf Outlet navigation channel would be detrimental to existing conditions both in the lake and in the navigation channel area. Accordingly, the Service finds that with a proper control facility the risk of detrimental effects of the low level plan is within reason.

#### RECOMMENDATIONS

The U. S. Fish and Wildlife Service therefore recommends that:

1. In the event you recommend the low level plan, your plan include provision for enlarging the structures in the tidal passes should the salinity gradient in Lake Pontchartrain, as established by a cooperative sampling program, be adversely affected.
2. The existing salinity gradient in Lake Pontchartrain be maintained insofar as salt water intrusion control requirements in the overall Lake Pontchartrain-Gulf Outlet complex will permit.
3. A structure, as necessary for salt water intrusion control, be built as a feature of the Gulf Outlet project in the Gulf Outlet-Industrial Canal connection with Lake Pontchartrain.
4. The pertinent design criteria and operational procedure for this structure be developed as a part of the continuing studies on the Gulf Outlet project.

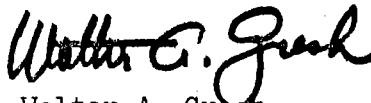
The Louisiana Wild Life and Fisheries Commission has reviewed this report and their letter of concurrence is attached.

In the event your plans are modified, we request notification and opportunity to revise fish and wildlife considerations accordingly.

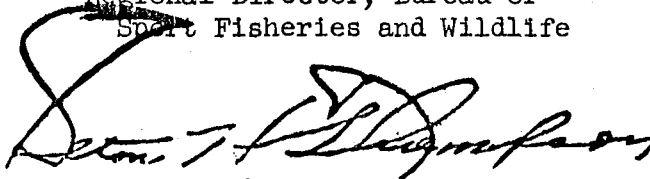
Should either of the alternate plans for hurricane protection be found favorable and authorized for construction, we request opportunity to review and comment on your detailed plans prior to construction.

We are pleased to have had this opportunity to work with you and members of your staff. It is requested that you notify us of your proposed action on our recommendations.

Sincerely yours,



Walter A. Gresh  
Regional Director, Bureau of  
Sport Fisheries and Wildlife



Seton H. Thompson  
Regional Director, Bureau of  
Commercial Fisheries

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