

Preface

Texas is the largest state in the continental United States. It is very diverse as to environment and industrial activities. In the eastern part of the state the rainfall and general climate conditions are very similar to those of the tributaries of the Mississippi River, whereas the western part of the state is arid and the rivers have very high conductivity and are often very hard.

Industrial activity is very different in the two parts of the state. In the eastern part of the state, industrial activities are very diverse. It is in this part of the state that oil was first discovered in the early part of the twentieth century and has dominated a considerable amount of the industrial activity. In the western part of the state, ranches and agriculture are the principal activities. The rivers are dammed and diverted and used heavily for these purposes. As a result, the Rio Grande no longer flows into the Gulf of Mexico, as not enough water is available at its outlet. The chemical characteristics of the river waters are very variable, and the associations of aquatic life indicate these conditions.

For this volume I have chosen the Sabine River and the Guadalupe River to represent the biological and chemical characteristics of rivers in the eastern part of the state. The Rio Grande, which forms the boundary line in Texas between Mexico and the United States, and the Pecos River have been chosen to represent western, arid-region rivers.

Reaches of the Guadalupe and Sabine rivers have been used to represent water conditions in the central and eastern part of Texas. The Guadalupe River is a hard, alkaline stream dominated by magnesium and calcium carbonates and bicarbonate alkalinity. The reaches described are in relatively unpolluted areas of the Guadalupe River. The Guadalupe River flows through the Edwards Plateau, descends the

Balcones Escarpment, and enters the Texas extension of the Coastal Plains Physiographic Province.

The Sabine River flows southeast and south for 380 mi from Hunt County in eastern Texas to Sabine Lake, and through the Sabine pass into the Gulf of Mexico. The entire Sabine basin lies within the Gulf Coast Plain Section of the Coastal Plain Physiographic Province ((N. M. Fenneman, *Physiography of the Eastern United States*, McGraw-Hill, New York, 1938). The Sabine River basin lies within three major resource areas: the Black Plain Prairies, East Texas Timberlands, and Coastal Prairie. The upper Sabine is a soft to medium-hard river and the nitrates and phosphates indicate some agricultural activity. However, the water chemistry indicates fairly normal conditions. The lower Sabine has soft to moderately alkaline slightly saline water. It is just above the reach where the intrusion of the tide meets the freshwater stream. Therefore, occasionally salt water intermingles with fresh water.

The aquatic life of the upper Sabine River is typical of a freshwater stream, whereas that which we studied in the lower reach is freshwater but also has species tolerant of a small amount of salinity.

For the Rio Grande and the Pecos, the principal activities of the watershed are agriculture and ranching. As a result, the rivers are diverted by dams and water is extracted for irrigation purposes. Indeed, the Rio Grande at the present time does not flow into the Gulf of Mexico because of this diversion. These are typically hardwater rivers.

The ecosystems for the Sabine and Guadalupe rivers have been developed carefully because of studies made by the Academy of Natural Sciences. Chemists as well as specialists in the various forms of aquatic life were present, and a team approach was taken for the studies. The studies for the Pecos and Rio Grande have been made by scientists from various universities and state agencies. These studies have, in some cases, been general but are specific in their objectives, such as studying the fish populations. These rivers have been very badly damaged by pollution mostly from agricultural sources, and therefore the ecosystems reflect these conditions. I have tried to describe functional ecosystems of both the Rio Grande and Pecos rivers, but they are not as specific as the descriptions of ecosystems in the Guadalupe and Sabine rivers. The descriptions of the ecosystems are for a larger area than they are for the ecosystems described in the Sabine and Guadalupe rivers.

The literature is very scattered as it pertains to the Rio Grande and Pecos rivers. The studies have not been as intense for given areas as they have been in the Sabine and Guadalupe rivers. For these reasons, the ecosystems are not developed as specifically. In the Guadalupe and Sabine rivers the ecosystems have been described for a limited area and the data were gathered by a team of scientists who were specialists in the various groups of organisms. In the western rivers, the Pecos and the Rio Grande, the ecosystems are more general than the detailed studies carried out by the Academy of Natural Sciences for the Sabine and Guadalupe rivers. However, I was able to construct functioning ecosystems by bringing together the data that were available.