Aquatic Weed Problems In Puerto Rico[1]

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ABSTRACT

The main aquatic plant problem areas are along the north side of the island from Rio Grande to Arecibo. Lesser infestations are in the river systems along the southern part of the island from Naguabo to Ponce and in the southwestern part of the island from Mayaguez through Valle de Lajas to Yauco. The major reservoirs infested are Lago de Cidra, Lago de Loiza, Lago de la Plata, Lago Dos Bocas, Lago Coamo, and Laguna Cartagena. There is relatively little infestation in the streams and lakes in the high mountainous interior. Waterhyacinth (*Eichhornia crassipes* (Mart.) Solms-Lauback) is the major aquatic plant problem but alligatorweed (*Alternanthera philoxeroides* (Mart.) Griseb.) is likely to become a problem when waterhyacinth is brought under control.

INTRODUCTION

Aquatic weed problems do exist in Puerto Rico and a control program is needed. The desire of local interests to participate in a program is such as to warrant establishment of a priority for expenditure of funds available. It seemed advisable to explore the situation with detailed coordination and joint appraisals of other agencies, before undertaking a general program. A meeting to discuss the program was held 5 June 1974, in the U.S. Army Corps of Engineers District Office in San Juan with representatives of the Puerto Rico Department of Natural Resources; Puerto Rico Aqueduct and Sewer Authority; Puerto Rico Water Resources Authority; and the Puerto Rico Environmental Quality Board.

RECONNAISSANCE STUDIES

During a preliminary reconnaissance of aquatic plants in June 1968 in the watersheds of Puerto Rico, representatives of the Corps of Engineers from the Jacksonville District, (June 1968) observed localized growths of alligatorweed and recommended introduction of the alligatorweed flea beetle (*Agasicles hygrophila* Selman - Vogt) as a measure of biological control. Research personnel of the United States Department of Agriculture (USDA), Fort Lauderdale, Florida, also visited the Commonwealth of Puerto Rico to observe the problems of aquatic weeds in large reservoirs, drainage and irrigation canals, and small farm ponds, with the assistance of Dr. F. F. Ferguson, Chief, Puerto Rico Field Station, Communicable Disease Center, and Mr. Rafael Reyes, Assistant General Manager of Irrigation Services of the Puerto Rico Water Resources Authority. The largest and probably most pressing problem appeared to be in the Lajas Valley Irrigation and Drainage District of the Puerto Rico Water Resources Authority.

The primary aquatic weed problem in the drainage laterals of the Lajas Valley area appeared to be paragrass (*Panicum purpurascens* Raddi.) and water smartweed (*Polygonum natans* Eaton). The use of 2,2-dichloropropionic acid (dalapon) and the dimenthylamine salt of (2,4-dichlorophenoxy) acetic acid (2,4-D) were recommended. A combination of these herbicides was suggested to control the cattails (*Typha* spp.) that were growing in the canals. (6, 7, 8).

Probably the easiest and most efficient way of spraying canals 10 m in width would be from the canal bank. Since roads have been constructed along the canal banks, it would be feasible to drive a truck along these canals and spray the aquatic vegetation. It would also be possible to use 30 m of hose connected to the tank pump with a hand-type quick-release gun connected to the end of the hose, for spraying. A man walking along the canal bank could apply the spray solution over the aquatic weeds or a boom could be mounted on the truck or trailer which would hang out over the canal surface.

Human health aspects of aquatic weed control are well documented. The problem is particularly acute in tropical areas such as Puerto Rico. Water weeds support many parasite and disease organisms including malaria, encephalitis, filariasis, schistosomes, liver flukes, and disease-pest arthropods. These problems must be dealt with in the interest of national health, throughout Central America and the Gulf Coast of the United States.

BIOLOGICAL CONTROL

During the past two decades, intensive efforts have been made to research biological methods of control as a means of more effectively controlling species of aquatic weeds such as alligatorweed and waterhyacinth. The U.S. Army Corps of Engineers has supported varied and wide spread efforts to achieve this end. Natural enemies of these plants have been studied throughout South America, Central America, Southern United States, Thailand, and India. (1, 2, 3, 4, 8, 9, 10, 11).

Insects have been used successfully as a form of biological control to suppress alligatorweed in Florida and other states of the Southeast under the Corps of Engineers Aquatic Plant Control Program in cooperation with the Division of Entomology Research of the USDA. The alligatorweed flea beetle was the first host-specific insect to be introduced. Other insects, alligatorweed thrips (*Amynothrips andersoni* O'Neill) and a stem-boring moth (*Vogtia malloi* Pastrana), are also host-specific and have been introduced for alligatorweed control. Infestations of alligatorweed are reduced to a maintenance status in most situations in the southeastern

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states where these insect controls have been released. These insect enemies could be released in Puerto Rico for the control of alligatorweed. Insects and diseases for control of waterhyacinth are not fully researched for field application but current results indicate that biological control of waterhyacinth is a very real possibility.

WATERSHED AREAS

The Rio Grande de Loiza—This basin is situated in the eastern central part of Puerto Rico and is the most prominent river in Puerto Rico. Its drainage area, which is the largest in Puerto Rico, is about 18 km² with major tributaries being the Rio Canovanas, Rio Canovanillas, Rio Caguitas, Rio Turabo, and Rio Gurabo.

A broad valley extending from Aguas Buenas in the west Pena Pobre in the east comprises a large part of the upper basin. It is in the valley near Caguas where the Rios Turabo, Caguitas, and Gurabo join the Rio Grande de Loiza to flow to the east. Flowing north from this valley, the Rio Grande de Loiza enters the Loiza or Carraizo reservoir, which is the water supply for the metropolitan San Juan area. A power installation at the dam is capable of generating 2,600 kw of electrical power. The waterhyacinth infestation starts just upstream of the Loiza reservoir, and heavy infestations occur in the reservoir causing problems in the generation of electrical power and water supply. Waterhyacinths are flushed from the reservoir and flow into the coastal plain east of San Juan.

Rio de Bayamon—The drainage area of the Rio de Bayamon originates in the central mountain interior of Puerto Rico where small tributaries collect at the Cidra Reservoir before emerging into a narrow valley. The stream flows 30 km through this valley and is joined by the Rio Guaynabo before reaching the coastal plain. This river drains an area of 16 km² and has caused, until the past few years, serious flooding. Lago Cidra storage is used to regulate runoff in the upper basin and serves as a source of municipal water. The lake is the major source of waterhyacinth infestation in the Rio de Bayamon watershed.

Rio de La Plata—The Rio de La Plata is a major river in the central part of Puerto Rico and drains a basin of 150 km² in area. This river, unlike the other large rivers to the west, has a long main stem. Significant tributaries are the Rio Hondo, Rio Arroyata, Tio Usabon, and Rio Guavate. The terrain of this basin is basically two types: the flat coastal plain and the interior mountains. The majority of the waterhyacinth infestations are in the coastal plain area in La Plata Lake.

There are three existing water resources developments in the Rio de La Plata. Lago Carite in the upper part of the basin collects and diverts all the normal runoff to the Rio Guamani on the south coast. The Puerto Rico Water Resources Authority has two small dams at which there are installed turbines and generators.

Lago La Plata located above Toa Alta has been recently constructed by the Aqueduct and Sewer Authority to provide for a water supply to the western part of the San Juan metropolitan area. Waterhyacinth infestations apparently start above this lake. During the filling of the lake large amounts of plants flowed into the lake from upstream and accumulated at the dam. One of the heaviest investations of waterhyacinths on the island is in the Rio de La Plata from Lago La Plata by Toa Alta to Dorado. In June 1974, the river was solidly, completely packed with waterhyacinths approximately 1.0 m in height.

Coastal flooding is a major problem in this basin. During major floods, the town of Toa Baja is completely inundated. Other communities in the coastal area affected by flooding are: Dorado, Toa Alta, Ingenio, and Companillas. Agricultural interests are also adversely affected by floods.

Rio Grande de Manati—The Rio Grande de Manati basin lies in the central part of the northern half of Puerto Rico. Encompassing some 100 km² of drainage area, this basin is one of the largest river basins in Puerto Rico. In the areas checked the river had a fairly rapid flow and steep banks. Waterhyacinths were noted in small pockets along the banks; however, free floating plants apparently flowed downstream into the Atlantic Ocean and were a minor problem.

Rio Grande de Arecibo—The Rio Grande de Arecibo is one of the large river basins of Puerto Rico. The basin is composed of three distinct types of terrain. A costal plain 5 to 8 km wide lies adjacent to the coast and is heavily infested with waterhyacinth. A 12-km strip of limestone formation, separates the coastal plain from the upper definable drainage basin.

There are several reservoirs in the basin: Dos Bocas, on the main stem at a point which controls flows from the basin streams, and a chain of small reservoirs, Lake Adjuntas, Pellejas, and Vivi, which tunnels into Lake Caonillas. All of these have been built and operated for power generation. Lago Dos Boccas is the only lake reported to have a waterhyacinth problem.

The principal community, Arecibo, is located on the west bank of the river along the coast. Industrial and commercial activity are predominant along the coastal plain along with sugar cane production. The municipality has been greatly subject to flooding which has affected the established development of the area.

The major waterhyacinth infestation is in the numerous channels in the delta area. The branches and side channels are also highly infested with waterhyacinth, however, the main river generally maintains itself free from the plants. Serious problems develop during high water when floating plants accumulate at the bridges and impede the flow of water.

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