Apuatic Weeds Of Lake Seminole, Jim Woodruff Reservior

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INTRODUCTION

The importance of aquatic weeds has increased significantly in recent years, especially in the southeastern and southern coastal areas of the United States. Excessive amounts of certain aquatic weeds interfere with commercial navigation and pleasure craft, reduce streamflow and contribute to flooding, interfere with fishermen and fish production, interfere with shoreline developments, interfere with swimming and other aquatic recreation, and contributes to the production of mosquitoes. That portion of Lake Seminole located in the State of Georgia with its shallow and clear areas of considerable acreage contains many of the most undesirable aquatic weeds.

LAKE CHARACTERISTICS AND CLIMATE

Lake Seminole was formed by the Jim Woodruff Dam which was designed and constructed by the U. S. Army Corps of Engineers across the Apalachicola River, west of Chattahoochee, Florida. The dam is located immediately below the union of the Chattahoochee and Flint Rivers which form the two (2) principal arms of the lake. Spring Creek and Fish Pond Drain, two (2) secondary arms of the lake, join the Flint River approximately six (6) miles above the confluence of the two (2) rivers. The west end of the dam is located in Florida and the east end in Georgia. Approximately two-thirds of Lake Seminole is in Georgia and the remaining one-third in Florida. The dam was constructed primarily for navigation with the available head to be used to produce hydroelectric power. At normal pool elevation, 77.0 feet mean sea level (msl), the lake has an area of about 37,500 acres, extending about 50 miles up the Chattahoochee River and 47 miles up the Flint River. The lake has a shoreline of 250 miles. The shoreline mileage does not include the numerous islands, both large and small, located in the lake. Excepting the old river run areas, old slough and pond areas, and creek channels, a large percentage of the lake is 7.0 feet or less in depth, having extensive areas too shallow for use of flat-bottom boats propelled by 10 h.p. outboard motors or larger.

Lake Seminole was impounded in steps or stages as features of the dam and the lock were completed. A partial impoundage was begun in March 1955. The pool was allowed to rise only to elevation 65.0 msl which occurred during the first week of April of that year. It was then held at about that elevation until the final stage of impoundage was begun in January 1957. The lake was allowed to fill to normal top pool elevation (77.0 msl) in the early part of February 1957. Since that time the pool elevation has been kept fairly constant, varying from about elevation 76.5 to 77.8.

After impoundment to elevation 77.0 feet numerous ponds and lime sinks in the second bottom (above the ordinary flood plain of the rivers) became a part of Lake Seminole. Aquatic plants common to the area were found in the ponds and lime sinks. Such plants presented little concern at the time since physical and biological factors have successfully kept them in check through the years. Impoundment upset the natural biological balance and many of the submerged, emergent, floating and marginal aquatic plants and grasses of the ponds and lime sinks became sources of infestation for many of the shallow water areas of the lake. The more common of these plants are as follows: fragrant water lily, *Nymphaea odorata*; american lotus, *Nelumbo lutea*; watershield, *Brasenia schreberi*; curlyleaf pondweed, *Potamogeton crispus*; southern naiad, *Najas guadalupensis*; duckweed, *Lemna minor*; maidencane, *Panicum hemitomom*; spatterdock, *Nuphar advena*; bladderwort, *Utricularia inflata*; common cattail, *Typha latifolia*; banana waterlily, *Nymphaea meximana*; waterwillow, *Justicia americana*; chara, *Chara fragalis*; winged water primrose, *Jussiaea decurrens*; and smartweed, *Polygonum spp.*

Extensive areas, approximately 10,000 acres, of Lake Seminole were not cleared of trees or brush prior to impoundment. Practically all of the flooded trees were dead by 1960, and as a result of natural pruning has reduced the remaining trees to snags of varying height. Waterfowl and fish are attracted to these uncleared areas in great numbers. Floating-type aquatic plants lodge and flourish in parts of these uncleared areas making control from boats hazardous and difficult due to submerged stumps and tall decaying snags, leaving any control to be accomplished by airplane.

Lake Seminole is located in an area that has a mild climate, a mean temperature of about 68 F, and a long growing season from the middle of March through October. Although winter temperatures sometimes drop below freezing for relatively short periods, they are not sufficiently low to kill or seriously damage aquatic plants in the lake, those in the bordering lowland and marshy areas, and those in lake-affected lime sink areas which are numerous near the lake between the Chattahoochee and Flint Rivers. Lake Seminole's favorable climate coupled with the great expanses of shallow, clear water of the Flint River, Spring Creek, and Fish Pond Drain Arms render conditions most ideal for all types of aquatic plant growth. Apparently, turbid water conditions on the Chattahoochee River arm have restricted aquatic weeds somewhat in this area. However, impoundments on the Chattahoochee River above Lake Seminole will no doubt, through sedimentation, help clear the waters of the Chattahoochee in the future, rendering them more suitable for aquatic plants.

HISTORY OF AQUATIC WEEDS AND CONTROL — LAKE SEMINOLE

Prior to the intermediate stage of impoundment (April 1955) an aquatic plant problem did not exist on Lake Seminole. Numerous aquatic plants had been noted in the

many small ponds (lime sinks) located within the area that was ultimately to become a part of the lake at full impoundment. These plants were largely confined to the margins of these ponds and were not considered to be a menace either by the public or the reservoir management personnel. Since full impoundment (February 1957), however, a few of these plants, viz., maidencane; american lotus; fragrant water lily; bladderwort; water plantain, *Alisma spp.;* watershield; buttonball, *Cephalanthus occidentalis;* banana water lily;; fanwort, *Cabomba caroliniana*; winged water primrose; and water willow have become minor problems in restricted areas. Common cattail, seemingly an unimportant marginal aquatic plant at the time of impoundment, has spread from a small infestation near the old Georgia Power Company dam installation on Spring Creek to much of the shore area of the reservoir. This plant, in addition to presenting problems from a recreational standpoint, has created mosquito control problems. In 1960 an aquatic plant survey revealed that approximately 1500 acres of common cattail were present in Lake Seminole. Another aquatic plant survey in September 1963 revealed about the same amount within the reservoir area. Aquatic plants, viz., water hyacinth, *Eichhornia crassipes;* alligatorweed, *Alternanthera philoxeroides;* parrotfeather, *Myriophyllum brasiliense*; and giant cutgrass, *Zizaniopsis miliacea;* presenting serious problems in 1963 were not known to exist in the reservoir area prior to impoundment. It is believed that these plants reached Lake Seminole from impoundments located above Lake Seminole on the Flint River.

The initial infestation of water hyacinth was observed in the vicinity of Big Horseshoe Bend on the Flint River Arm of Lake Seminole in the early spring of 1955. The herbicide, 2-4,D, at 2 lb/A was applied from boats in the late summer of 1955, and an excellent kill resulted. Very little control work was attempted after the summer of 1955 until the summer of 1958. At that time, it was estimated that several thousand acres of water hyacinth were on the Flint River Arm of Lake Seminole. Two aerial contracts, specifying the use of helicopters, were let in the summer, July and September, of 1958. Under the first contract 1,054 acres of water hyacinth were sprayed at a cost of $10,700. This contract partially covered the Flint River Arm from mile 11 to mile 27. At the completion of this contract, inspections indicated that an excellent kill resulted in the areas covered. Calibrations of the equipment prior to beginning spray operations assured us of an application of 2 lb/A. Under the second contract 2,015 acres of water hyacinth were sprayed at a cost of $12,150. This contract covered the Flint River Arm from mile 37 ("Red Bluff") to mile 3 and covered the Chattahoochee River Arm from mile 8 down to the Jim Woodruff Dam. Also covered under this contract were the numerous islands located between the Flint River and the Chattahoochee River arms of Lake Seminole. The areas sprayed under the first contract were checked, and all reinfestations, resprouting, and areas that were not treated during the first contract were sprayed under the second contract. Inspections, both by airplane and boats, made several weeks after the completion of the second contract indicated that an excellent kill had been obtained. Herbicides were also applied by boat crews during the summer of 1958 in order that all areas of the lake might be covered.

In the early spring of 1959 water hyacinth were again discovered entering Lake Seminole via the Flint River in the vicinity of Bainbridge, Georgia. An investigation revealed that the plants were reaching Lake Seminole from impoundments upstream. The 2-4,D was applied by boat crews during the 1959 and 1960 growing seasons. The boat work during these seasons was limited to shorelines along the main river channel and the margins of the uncleared areas. The limitations were necessary because of shallow water outside the channel, and the difficulty of navigating in the stumps and dead snags of the uncleared areas. The boat work of keeping the plants sprayed along the margins of the infested areas during these years generally prevented the further spread of water hyacinth. The acreage of water hyacinth, increased considerably during the 1959 and 1960 seasons even though the spray operations prevented spread to new areas. This increase occurred in areas which could not readily be reached by the spray boats. Again in early 1960 water hyacinth were observed entering Lake Seminole via the Flint River at Bainbridge, Georgia.

During August and September of 1960 a systematic aquatic plant survey was made of the entire lake, and a comprehensive report compiled. At the time of the 1960 survey, it was estimated that 2500 acres of water hyacinth were on Lake Seminole. Herbiciding operations were being continued during the time of this survey.

Alligatorweed was found for the first time on Lake Seminole in the vicinity of Butler Mill Creek on the Flint River Arm during the 1960 aquatic plant survey. This plant was found in small patches from Hutchinson's Ferry to Bainbridge, Georgia, on both sides of the Flint River arm. A total of 5 acres was estimated to be on Lake Seminole.

High inflow into Lake Seminole from the Flint River during the early spring of 1961 greatly reduced the acreage of water hyacinth in Lake Seminole. Large quantities were stranded above the normal shoreline, in bushes above the water, and large quantities were carried through the gated spillway of the Jim Woodruff Dam into the Apalachicola River. During the growing seasons of 1961 and 1962 alligatorweed increased considerably while water hyacinth and parrotfeather apparently decreased. During these seasons herbiciding operations were continued by boat crews further reducing the acreage of water hyacinth and parrotfeather. Alligatorweed, quickly recovered from the effects of the herbicide applied at low dosages and continued to spread at its usual, characteristic, alarming rate.

An aquatic plant survey conducted in September 1963 revealed that alligatorweed had definitely replaced water hyacinth and parrotfeather in importance and acreage. At that time it was estimated that 350 acres of alligatorweed, 200 acres of water hyacinth and only a trace of parrotfeather existed on the Flint River arm of Lake Seminole. The survey also revealed that practically all of the small boat channels (totalling about 15 miles) were infested with submersed weeds. This situation can be readily understood when it is known that these channels are shallow, 4 to 5 ft. depth, and are located in clearwater areas of the lake. Curlyleaf pondweed was the principal submersed weed in 1963 and continues so today. Several attempts have been made on an experimental basis to remove the submersed aquatics by applying herbicides in many different rates and combinations to sections of the small boat channels. To date the results have been very poor. Temporary control of this submersed plant has been achieved since 1963 by the use of mechanical cutters which traverse the channels twice monthly during the growing season, April to October. Problems to boating, fishing, and other forms of water recreation caused by submersed aquatics are

destined to become more numerous and acute in the shallow, clear-water areas of our lakes and streams.

The rapid spread of giant cutgrass on both the Chattahoochee and Flint River arms of Lake Seminole was also noticeable during the September 1963 aquatic plant survey. This plant in 1963 was becoming well established along the shorelines and in the shallow water areas.

Herbiciding operations were continued during the 1963 growing season. The main objective being to prevent the spread of the two major problem plants, water hyacinth and alligatorweed. With the exception of the two aerial contracts mentioned earlier all herbicides have been applied by boat crews. It might be of interest to mention again at this point that boat work on Lake Seminole is limited, due to shallow water, stumps and dead trees. In most instances such work is restricted to the deep-water edges of the infestations.

Experimental work using various herbicides and combinations of herbicides for the control of alligatorweed was initiated in 1963 by Dr. John Lawrence of Auburn University under the Corps' Expanded Aquatic Plant Control Program. This experimental work has been continued since 1963 and at a gradually reducing rate during 1966 and 1967. Under the conditions prevailing on Lake Seminole, the experiments have revealed that repeated herbicidal treatments can check the spread of alligatorweed.

During the summer of 1964 experimental plots were also established on Lake Seminole by Dr. Lyle Weldon of the Agricultural Research Service for purpose of comparing experimental results with similar plots established on other impoundments located in the South Atlantic and Gulf Coastal States as part of the environmental testing program under our Expanded Project for Aquatic Plant Control. Several colonies of flea beetles, *Agasicles n. sp.*, were established at Lake Seminole last year and have increased in size and extent to show activity in suppressing alligatorweed in the immediate area.

Limited aquatic herbicidal control work has been continued during 1964 through 1967. The purpose of this work was more or less to maintain area control of the known serious aquatic pests. This work has been successful in so far as the emersed and floating species are concerned, but it has been something less than effective with the submersed species. Mechanical cutters have been used continuously during the growing seasons to maintain the small boatways in a navigable condition. Although mechanical cutters aid the spread of submersed aquatics by vegetative means, the temporary relief gained by their use makes this operation justifiable until a satisfactory chemical for control use is found.

In 1966 a sizable infestation of eurasian watermilfoil, *Myriphyllum spicatum*, was discovered in Spring Creek, a secondary arm located in the mid-section of Lake Seminole. Within a six month period an estimated 1500 acres had become infested with this plant. Speculation has this plant arriving in our area either by fishermen from infested lakes of the TVA or by collectors of aquatic plants. Whatever the source, this plant renders many hundreds of acres useless during the growing season, and the Lake Seminole infestation may be serving as a possible source of infestation for areas downstream from the Jim Woodruff Dam. At the present time eurasian watermilfoil is only found in the Spring Creek arm of Lake Seminole. This fact may be of particular significance because it is known that Spring Creek contains a much higher concentration of calcium than the other streams coming into Lake Seminole. It is hoped that the lesser concentration of calcium found in the areas of Lake Seminole other than the Spring Creek arm will prevent its spread to those areas. This is a possibility, and it is hoped that it proves to be the case.

Early in 1967 Florida elodea, *Hydrilla verticillata*, and marshweed, *Limnophila indica* were found in small patches adjacent to a public access area on Lake Seminole. Here again it is suspected that these plants were inadvertently introduced into Lake Seminole by persons collecting aquatic plant material for aquariums. One can only guess what the future aquatic problems will be like with the introduction of such species as these.

In October 1967 several small patches of marsh pennywort, *Hydrocotyle ranunculoides*, were discovered on the Flint River arm of Lake Seminole. When discovered the patches contained less than 10 sq. ft but were very lush in growth. This plant was growing in association with alligatorweed and water hyacinth. The infestations of pennywort were observed during the winter of 1967 and early 1968, and it was affected very little by frost and was actually taking over areas infested with alligatorweed. Routine checks during April 1968 revealed that the patches discovered last October are now approaching the one-half acre size and are completely taking over areas from the alligatorweed.

In April 1968 two watermilfoils new to Lake Seminole were found on the Fish Pond Drain arm (secondary). *Myriophullum heterophyllum* and *Myriophyllum laxum* were found in close association with other aquatics in a small embayment of clear water. A more thorough check or survey will be required during the next growing season in order to determine the extent of those plants in Lake Seminole.

Much study and observation will be required to determine the wisest course to take in our efforts to control aquatic weeds in our lakes and streams. We will continue our surviellance and control of the more obnoxious aquatic plant species. It is hoped that in the future we can better control or eliminate some of the most obnoxious plant species with desirable plants to preserve the scenic beauty of the project, its fish and wildlife habitat, and its use for recreational purposes.