

A Progress Report On The Use Of Sulphuric Acid Treatment For Elodea Control

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INTRODUCTION

Crystal River, Florida, is located approximately 68 miles north of Tampa, Florida, on U. S. 19-98, in Citrus County. The Crystal River has its origin near the village of Crystal River where a large number of springs or boils are located in an area called Kings Bay. Crystal River, as its name implies, is a clear body of water with a very low turbidity. Aquatic vegetation in Crystal River develops large luxuriant beds and enjoys rapid growth rates because of this low turbidity.

Private homes, subdivisions, motels, hotels, fish camps, and fish houses are located on the perimeter of Kings Bay. The land area has been highly developed in the immediate vicinity of Crystal River, but further west toward the Gulf of Mexico the salt water marshes have remained unchanged through the years.

Commercial fishing operations which include net boats, charter fishing boats, shrimpers, and crabbers have been conducted out of this harbor for many years.

Several commercial fishing camps are located throughout the area which offer guide service, free boat ramps, fishing tackle, fish bait (both artificial and live), rental boats, and other miscellaneous equipment for the sports fisherman.

Sport fishing in the area is composed of both fresh water species, due to the large number of springs, and salt water species, as a result of the close proximity of the Gulf of Mexico.

The presence of extensive beds of *Elodea densa* and *Elodea canadensis* has had a tremendous effect upon the economy of the area. The importance of water navigation can not be taken lightly when a large number of people depend on the Crystal River for their livelihood. Dense stands of aquatic vegetation have completely choked off several canals and made access to fishing camps difficult.

Residents who have built retirement homes, complete with docks and boat canals, are discouraged when they can no longer run their small fishing boats to their favorite fishing hole.

Motel owners with facilities built upon the banks of the river complain bitterly about the dense, unsightly, and often odoriferous beds of elodea. They contend that the natural beauty of the area has been destroyed by this noxious vegetation.

HISTORY

The use of sulfuric acid to control elodea was proposed by Mr. Robert Hyde of Crystal River, Florida. Following several weeks of study he determined in the laboratory that he could kill elodea by lowering the pH of water to 5.5 and prevent reproduction at a pH of 6.0. A cheap source of lowering the pH in a large body of water naturally led him to

the sulfuric acid industry located in the rich phosphate region of Central Florida.

Several small scale experiments were conducted by Mr. Hyde involving only five gallons of concentrated sulfuric acid (93%) in small boat canals. The success of these small operations led to large scale operations with 3,600 gallons of sulfuric acid being placed in various trouble spots in one day.

Sulfuric acid is approximately twice the weight of water; therefore, it tends to remain on the bottom of the river after it has been introduced, and seeks the lowest level. The results are dramatic to say the least. Large amounts of elodea are cut loose from the river bottom after a period of one or two weeks, and through tidal action are moved out into salt water where the plant is destroyed.

MATERIALS AND METHODS

In August, 1965, the Fish Restoration Team of the Florida Game and Fresh Water Fish Commission was assigned to observe and investigate the effects of sulfuric acid as a control for noxious vegetation, with particular emphasis on the removal of elodea in the Crystal River section of Citrus County. The first acid drop conducted while the F-R Team was present was in an area just off Paradise Point. Blue crabs, crayfish, and several small fish including bluegill and shell-cracker were observed in distress during the application of the acid. A check of the area by boat the following day did not reveal any dead fish. Several hundred seagulls were observed in the area late in the afternoon and it is believed that these birds picked up the dead fish.

In September of 1965, fish population samples were conducted using 500 yards of trammel net (2-250 yards each), rotenone spot samples, and electro-fishing gear. (See Tables 1 through 6). These samples were taken in several untreated areas as well as in treated canals and bays. In order to best sample the smaller canals the trammel nets were cut into 125 yard lengths. Mr. J. E. Burgess, Biologist with the State

Table 1. Results of rotenone spot sampling prior to treatment.

Species	Size Range In Inches	Number	Weight	% Comp. Number	% Comp. Weight
Largemouth bass	4.0-5.0	4	.2	19.0	28.5
Shellcracker	2.0-4.0	7	.2	33.3	28.5
Dollar sunfish	1.0-2.0	3	Tr.	14.2	Tr.
Hogchoker	2.0-2.0	1	Tr.	4.8	Tr.
Mojarra	2.0-2.0	3	.1	14.2	14.3
Pinfish	3.0-3.0	2	.1	9.5	14.3
Redfish	4.0-4.0	1	.1	4.8	14.3
TOTAL		21	.7	99.8	99.8

Table 2. Results of rotenone spot sampling following treatment.

Body of Water: Crystal River			Date: November 29, 1965		
Method: Rotenone — 1 Acre			Location: Paradise Point		
Time: P.M. County: Citrus			Personnel: Cordell and Phillippy		
Species	Size Range In Inches	Number	Weight	% Comp. Number	% Comp. Weight
Largemouth bass	5.0-15.0	11	3.1	17.7	50.8
Shellcracker	4.0- 7.0	21	2.6	33.9	42.6
Warmouth bass	2.0- 6.0	2	.2	3.2	3.2
Dollar sunfish	1.0- 2.0	11	.1	17.7	1.6
Red minnow	1.0- 1.0	17	.1	27.4	1.6
TOTAL		62	6.1	99.9	99.8

Table 3. Results of electro-fishing population sampling prior to treatment.

Body of Water: Crystal River			Date: July 14, 1964		
Method: 230 Volt Electro-fishing			Location: West of Crystal River		
Time: 30 Minutes County: Citrus			Personnel: Cordell and Phillippy		
Species	Size Range In Inches	Number	Weight	% Comp. Number	% Comp. Weight
Largemouth bass	3.0-11.0	11	1.25	28.9	28.9
Bluegill	6.0- 6.0	1	.2	2.6	4.7
Shellcracker	4.0- 8.0	13	1.0	34.2	23.3
Hogchoker	4.0- 4.0	1	Tr.	2.7	Tr.
Pinfish	3.0- 4.0	3	Tr.	7.8	Tr.
Brook silverside	3.0- 3.0	5	Tr.	13.1	Tr.
Mojarra	3.0- 3.0	1	Tr.	2.7	Tr.
Longnose gar	6.0-11.0	2	.05	5.2	1.2
Fla. spotted gar	22.0-22.0	1	1.75	2.7	40.7
TOTAL		38	4.3	99.9	99.9

Table 4. Results of electro-fishing population sampling following treatment.

Body of Water: Crystal River			Date: January 6, 1966		
Method: 230 Volt Electro-fishing device			Location: American Legion Beach		
Time: One Hour County: Citrus			Personnel: Cordell and Phillippy		
Species	Size Range In Inches	Number	Weight	% Comp. Number	% Comp. Weight
Largemouth bass	3.0-14.0	27	4.6	21.0	8.5
Bluegill	4.0- 6.0	7	.6	5.4	1.2
Shellcracker	4.0- 7.0	18	2.3	14.0	4.2
Chubsucker	6.0-15.0	17	13.3	13.3	24.5
Mullet	13.0-20.0	15	21.6	11.7	39.8
Warmouth bass	2.0- 6.0	3	.3	2.3	.6
Spotted sunfish	3.0- 4.0	8	.5	6.3	.9
Seminole killifish	6.0- 7.0	3	.3	2.4	.6
Mojarra	4.0- 4.0	6	.3	4.7	.6
Bowfin	25.0-25.0	1	5.8	.8	10.7
Needle fish	9.0-10.0	4	.2	3.1	.3
Golden shiner	7.0-11.0	15	3.5	11.7	6.4
Fla. spotted gar	12.0-13.0	3	.8	2.4	1.4
Blue crab	6.0- 6.0	1	.1	.8	.2
TOTAL		128	54.2	99.9	99.9

Table 5. Results of trammel net sampling prior to treatment.

Body of Water: Crystal River			Date: October 15, 1965		
Method: 250 Yard Trammel Net			Location: Main Channel		
Time: 12 Hr. Overnight County: Citrus			Personnel: Cordell and Phillippy		
Species	Size Range In Inches	Number	Weight	% Comp. Number	% Comp. Weight
Largemouth bass	11.0-23.0	3	7.8	2.4	6.0
Bluegill	7.0- 7.0	5	3.0	3.9	2.4
Shellcracker	7.0- 7.0	1	.3	.8	.2
Chubsucker	10.0-14.0	50	46.3	39.3	35.6
Yellow bullhead	9.0-12.0	15	9.9	11.8	7.6
Black bullhead	11.0-11.0	4	3.0	3.1	2.4
Warmouth	7.0- 8.0	6	2.2	4.7	1.6
Golden shiner	10.0-10.0	7	3.0	5.5	2.3
Longnose gar	46.0-46.0	1	16.0	.8	12.3
Pinfish	8.0- 9.0	22	7.6	17.3	6.0
Mangrove snap'r	10.0-11.0	6	4.3	4.7	3.3
Redfish	24.0-30.0	2	16.5	1.6	12.7
Sheepshead	15.0-19.0	2	7.3	1.6	5.6
Saltwater catfish	11.0-16.0	3	2.7	2.4	2.0
Blue crab*	6.0-10.0	74	NW		
TOTAL		127	129.9	100.0	100.0

*Not included in summary of fish population.

Table 6. Results of trammel net sampling following treatment.

Body of Water: Crystal River			Date: October 7, 1965		
Method: 250 Yard Trammel Net			Location: Crystal Lodge		
Time: 12 Hr. Overnight County: Citrus			Personnel: Cordell and Phillippy		
Species	Size Range In Inches	Number	Weight	% Comp. Number	% Comp. Weight
Largemouth bass	11.0-20.0	3	7.1	1.4	4.9
Bluegill	6.0- 8.0	2	.7	.9	.5
Shellcracker	7.0- 7.0	3	.9	1.4	.6
Warmouth bass	7.0- 7.0	1	.3	.5	.2
Black bullhead	9.0-13.0	34	20.3	16.2	13.9
Yellow bullhead	9.0-15.0	19	17.1	9.0	11.8
Chubsucker	10.0-14.0	86	55.9	41.0	38.6
Golden shiner	10.0-11.0	24	10.7	11.4	7.4
Pinfish	7.0- 9.0	6	2.2	2.9	1.5
Mullet	13.0-19.0	14	19.7	6.7	13.6
Mangrove snap'r	9.0-12.0	18	10.1	8.6	7.0
Blue crab	6.0-10.0	18	NW		
TOTAL		210	145.0	100.0	100.0

*Not included in summary of fish population.

Board of Health, studied the effect of sulfuric acid on bottom organisms.

DISCUSSION

Results of sampling for bottom organisms indicate that there are more organisms available following an acid treatment than samples collected preceding the operation. Fish population sampling conducted in the areas would indicate more fish following treatment than preceding treatment, however, it is particularly true of the fish population sampling, that the gear was not as efficient collecting specimens in dense weed situations as it was in the clear areas following

treatment. Trammel netting was made difficult by large beds of elodea that interfered with the operation of the nets and may have restricted the normal movement of fishes which could have reduced the catch in untreated waters.

CONCLUSIONS

Sulfuric acid did effectively remove elodea from the main channels apparently causing little damage to the fish population. The amount of damage varies from application to application depending on tidal effects, proximity of springs, and escape route available to fish in the area.

Use of sulfuric acid as a herbicide for control of sub-

mersed aquatic vegetation may be limited to water areas similar to the conditions in Crystal River. Neutralization and dilution by the waters of the many springs, tidal effect, and extensive deposits of calcium carbonate combine to contain the action of the acid within an area. Its use in static water situations such as lakes, ponds, reservoirs, and canals with deep cut gliding channels may create more problems than it solves.

Additional study will be required to determine what effect re-treatment with sulfuric acid will have upon the aquatic environment after the abundant calcium carbonate deposits have been consumed by prior treatment.