Harvesting Aquatic Vegetation

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Excessive water fertilization, roughly coinciding with the widespread use of chemical fertilizers which ultimately tend to run off into recreational lakes and other waterways, has in recent years posed problems in the effective management of overproduction of various forms of aquatic vegetation. Subsequent decomposition of this growth along shorelines, often creates nuisance conditions which spoil the recreational, aesthetic, or economical utility of the waterway. It would therefore seem that nutrient removal is often necessary to maintain our natural resources in the best possible condition. Mechanical weed removal is one way to accomplish this end economically and effectively.

Mechanical weed removal has several advantages:

1. It can provide immediate relief from local nuisance conditions. 2. It probably does not tend to alter plant-to-animal life balances as drastically as may chemical treatments. 3. It does not introduce foreign substances into the water. 4. By removing nutrients, it should tend to reduce the rate of lake filling by plant residues.

Mechanical control measures usually consist of some form of cutting, followed—either directly or as a secondary operation—by collection and disposal. Secondary operations pose problems of having the nuisance of large quantities of vegetation in shallow bays, around piers and boat anchorages, problems of timing before decomposition begins, and of the possibility of rendering waterways temporarily impassible. The alternative, is to collect and dispose of the residues immediately after cutting, which is the approach we use.

DESCRIPTION

A horizontally positioned 10-ft. cutter-bar, adjustable as to depth, is mounted on a self-propelled steel barge. The cut weeds are fed onto an inclined mesh-type conveyor belt, which transfers them to a storage area at the rear of the barge. The excess moisture may drain from the weeds in the storage area. Transfer of a full load of weeds to a steel self-propelled transport barge takes less than 3 min. A barge is coupled to the harvester via a hydraulically-actuated coupler, which aligns the two units. The fully-loaded barge can accommodate 5 or 6 tons of vegetation. It is available with three standard power options to accommodate conditions—outboard drive, air-cooled inboard/outboard drive, and a paddle wheel drive for extremely shallow areas. Multiple transport barges can be used, if necessary, so that the harvester can be in continuous operation in cutting weed growth.

A companion crane-conveyor unit, hydraulically operated, and designed for narrow waterway access, removes weeds directly from the shallow-draft (18 in. when fully loaded) barge to a disposal area, or a truck.

All mechanical operations are hydraulically-controlled, and to date have proven remarkably free of maintenance and fouling problems. Individually hydraulically-driven paddle wheels on the harvester permit an unusual degree of mobility to the unit, and the shallow draft (14 in. when fully loaded with a ton of weeds) permits its use in very shallow bays and inlets. On occasion, the nose of the harvester has been "anchored" by depressing the front-mounted conveyor and cutter-bar assembly into the bottom, and generating a circulating current with the paddle wheels to wash fish, debris, and algas concentrations out of shallow inlets, and from around piers, into deeper water where they may later either sink or be collected.

The design of the unit is such that, with very slight modification, the transfer conveyor from front ramp to rear storage area could be placed laterally. In this manner, harvesting of a swath of water hyacinth adjacent to the shoreline could be accomplished with ease, and immediately transferred along the shore, where the plants dry up and die.

The cutter bar itself is fabricated from a special alloy, and has been run into hidden obstructions, stones, and the like with impunity. A patented protective circuit prevents damage to the teeth until the harvester can be reversed to free it from the obstruction. Telephone-pole-sized logs up to 35 ft long have been dredged from the silt without damage to the conveyor unit.

LOCATION

The bulk of the work with the present series of machines has been done on Pewaukee Lake, Wisconsin, our "experimental lab"—for want of a better term. Earlier versions of a similar machine, also largely designed by us, were active in the well-known Caddo Lake, Texas, experiments sponsored by Texas A & M College on the economic and nutrient value of aquatic plants as animal fodder. Much time, effort, and ingenuity was spent in these earlier efforts to reduce the moisture content, and to compact the weed, since water plants are structured differently than grasses and grains on land.

Pewaukee Lake, 25 miles west of Milwaukee, Wisconsin, comprises some 2500 acres of recreational facilities with 50% of the lake less than 12 ft deep. It forms the drainage basin for some 7500 Acres of surrounding farm and pasture land. It is the nucleus of extensive sporting activity, including fishing, power boating, racing of all sorts, sailing regattas,, ice fishing, and ice-boating.

HISTORY

In 1944 the property owners of Pewaukee Lake formed a Sanitary District to raise funds to combat a very serious weed problem then existing on the lake. In 1945, operations were limited to a simple Hockney Weed Cutter, which only cut the weeds and allowed them to drift ashore. Individual property owners assumed responsibility for clearing such detritus as accumulated on their shores. As you will undoubtedly appreciate, this turned out to be a not-too-equitable and satisfactory arrangement. There was no operation at all on Pewaukee Lake during the year 1946.

In 1947 a multiple approach to the problem was attempted. Chemical treatment of selected areas of the Lake was initiated, and in June, 1947, the Sanitary District contracted for the first piece of mechanical equipment specifically designed for the removal of floating vegetation. This was used in conjunction with the Hockney Cutter. Weeds were transported ashore by barge, and loaded onto a truck by conveyor. This method was used for a number of years.

Experimentation continued with mechanical and chemical methods, and in 1955, by special permit, 2000 gal of sodium arsenite were used to treat a specific area of the lake in order to ascertain whether or not *all* weeds could be removed by chemical means. The result was devastating. Fish were killed by the millions—particularly the new generations, up to 4 in long. The following season, curly-leafed pondweed (*Potamogeton crispus*) was mature and ready to harvest in the experimental area two weeks prior to any other area in the lake. This area has since proven to be one of the most difficult to control on the lake. Present Wisconsin statutes restrict chemical treatment to marginal shoreline treatment. The rest of the area has to be controlled by other means.

By 1958 a much improved harvesting machine had been developed and was designed to cut and remove from 0.5 to 0.75 acre/hr by two men. By 1960 up to 0.75 acre/hr could be harvested and unloaded to the transport barge by one man. During the latter part of 1963, the Grinwald Corporation had perfected the present machine which could harvest up to 1 acre/hr. in medium to average growth, and could remove 6 tons of weed per hour under average conditions. Refinements and improvements are still being made (Figure 1).

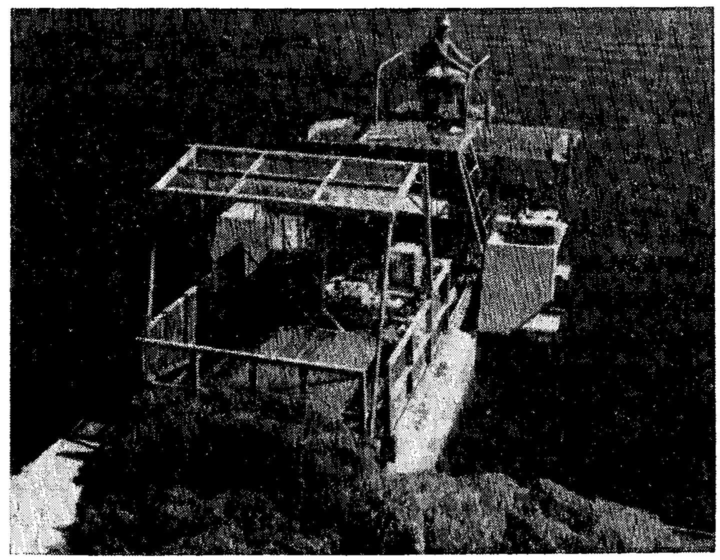

Figure 1. The harvesting machine made by Grinwald-Thomas Corp., Hartland, Wis., transferring vegetation from harvester to transfer barge.

CONCLUSION

As to the effectiveness of mechanical harvesting, we can only go by experience. Considerable data of a scientific nature has to be collected. Better records have to be kept. Little is presently known of the actual and desirable interrelationships of the natural plant-to-animal life balance.

We *do* know that the types of weeds prevalent now are different than a decade ago. Today Pewaukee Lake is 80 to 90% eurasian watermilfoil (*Myriophyllum spicatum* L.), a difficult variety to control, which is also seemingly resistant to chemical treatment.

A 2000 ft. channel, mechanically harvested for 4 years of heavy weed growth to open a public access to the lake, did *not* require harvesting the fifth year, while the weed growth on either side of the channel was as dense as ever. A similar situation seems to have occurred in Rib-lake, Wisconsin, where after two years of harvesting, practically none was required the third year. Water clarity and fishing conditions have reportedly improved considerably.