PROJECT LPL-263

FEASIBILITY STUDIES FOR THE REMOVAL OF <u>MYRIOPHYLLUM</u> <u>SPICATUM</u> FROM DEEP AND SHALLOW AREAS IN FOREST LAKE, FOND DU LAC COUNTY, WI AND THE PLANTING OF NATIVE AQUATIC PLANTS

FOR

THE FOREST LAKE IMPROVEMENT ASSOCIATION

BY

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OCTOBER 1995

ABSTRACT

Two feasibility studies, emphasizing the removal of *Myriophyllum spicatum* L. (Haloragaceae) and replacement with native aquatic plants, were performed for the Forest Lake Improvement Association during the summer of 1995. Frames, constructed from PVC pipe and a black membrane, were used to remove *M. spicatum*. Several methods to improve the underwater handling of these frames were tested. Upon removal of *M. spicatum*, several methods for planting native aquatic plants were tested. Evaluation of the planting methods will require several seasons of observation to determine the effectiveness of each method. Visual observations were made of the *Najas* plants transplanted in 1993 (Gerber, 1993a). *Najas* plants have continued to grow in the areas where the initial plantings were installed (North shore of Forest Lake).

STUDY #1: AQUATIC PLANT MANAGEMENT FOR CONTROL OF MONOCULTURAL STANDS "ISLANDS" OF MYRIOPHYLLUM SPICATUM IN FOREST LAKE, FOND DU LAC CO., WI

PURPOSE

Concern over the growth of the aquatic "weed" Myriophyllum spicatum (Eurasian Watermilfoil) in Forest Lake has prompted research involving the control of this weed over the past two summers. Upon completion of an aquatic plant survey in the summer of 1993, frequency, relative frequency, abundance, and relative abundance data were collected for the aquatic plants, including Eurasian Watermilfoil, of Forest Lake (Gerber, 1993b). The presence and abundance of Eurasian Watermilfoil was recorded for 20 transects located around the lake (Appendix I, Gerber, 1993b). Eurasian Watermilfoil distribution was also mapped (Fig. 1). While the greatest Eurasian watermilfoil densities were found around the lake's shore, dense growth of these plants was also found in deeper water (approximately 15 feet) in the Northern part of the lake. When the plants reached the surface, they formed dense patches which looked like "islands" when viewed from a boat.

Using bottom (benthic) barriers to control these dense Eurasian Watermilfoil patches in deep water presents a problem that is not encountered in shallow water. Unless several divers are present, it is difficult to install a bottom barrier in deep water because the sediments are much less firm than sandy shoreline sediments in shallower water. The purpose of this work was to develop a method of installing bottom barriers in deep water using only one diver.

METHODS

A portable frame unit (see Kendziorski, 1995) was designed to allow a single diver to place bottom barrier sections on the sediments. Twelve portable frames were constructed of 3" PVC measuring 7' X 8' (area of 56 ft^2). Each frame was covered with a 12 mil scrim reinforced black polyethylene membrane (the bottom barrier material). The membrane was attached using duct tape. Inserted inside of each frame was rebar for added weight. Holes were drilled into the PVC frame for water entry to allow submergence of the completed frame. Each frame was also fitted with two valves, one which allowed air to escape from the sinking unit and the other to allow compressed air into the unit to raise the frame to the water's surface.

Prior to frame installation, Eurasian Watermilfoil biomass samples were collected in triplicate in both shallow and deep water sites prior to frame installation. Each sample (shoot material only), collected using a 0.25 m X 0.25 m sampling device, was dried for two days at 105°C to constant mass. Average dried shoot mass for each site was recorded.

PRELIMINARY RESULTS AND RECOMMENDATIONS

In early June, six frames were submerged and arranged in a square shaped "kill" area (336 $ft.^2$) on top of a Eurasian Watermilfoil stand (avg. 31.5 g dry shoot biomass/m^2). This deep water area (approximately 10 ft. depth), marked with a bouy the previous season, was located at the north end of Forest Lake where dense Eurasian Watermilfoil growth had been observed (Figs. 1 & 2). Four frames were also submerged in shallow water (approximately 5 ft. depth) close to shore on the north end of the lake (Fig. 2). These frames were arranged to form a 224 $ft.^2$, square "kill" area on top of a Eurasian Watermilfoil stand (avg. 9.8 g dry shoot biomass/m^2).

From the shallow water site, one frame was successfully raised to the surface using compressed air. The other three frames were not tested. Compressed air forced water out of the frame through the holes drilled in the PVC frame. The entire frame however did not raise at once. One edge of the frame reached the surface first then the entire unit eventually rose to the lake surface. Several other methods were discussed and tried at a later date.

In late June, two more frames were submerged in the deep water area adjacent to the other frames. Four more frames were submerged and located adjacent to the others in the shallow water area.

After several weeks in the water, visual inspection of the 10 frames submerged in early June revealed that the membrane was separating from the PVC pipe on several frames in the deep water site. This separation was not observed for the frames in the shallow water site. To remedy this problem, a new frame was built using cord to lash the membrane to the PVC frame. This method proved unsatisfactory and no new frames were constructed this way.

Initially, there was some concern that the frames would settle and maybe move on top of the sediment over time. The frames showed no signs of movement during the six week period following their installation. It was also noted that Eurasian Watermilfoil plants grew between the edges of adjacent frames.

On 21 July, approximately six weeks after their installation, the eight shallow water frames were repositioned on top of more Eurasian Watermilfoil plants. These frames were arranged so that the area previously killed was surrounded by frames. The area from which the frames were removed was completely devoid of living plant material. The control of Eurasian Watermilfoil appeared to be a complete success.

In early August, all frames from the deep water site were raised to the surface and taken ashore to reattach the membrane to the PVC frame. The membrane for each frame was refastened using washers and screws. The frames were then repositioned in the deep water site. Upon visual inspection, it was observed that the membranes on the frames in the shallow water were also separating. These frames were fixed as above.

Evidence of good plant control was demonstrated in the deep water site in the areas underneath the membrane. A six week "kill" time seemed to be very effective in controlling plant growth.

However, Eurasian Watermilfoil growth did continue to occur in the cracks between adjacent frames. It is recommended that some membrane strips be used to cover these cracks to eliminate this growth.

On 9 September 1995, the frames in the deepwater site were repositioned and the frames from the shallow site were also installed at the deepwater site (total of 16 frames). These frames will remain in the deepwater site until Spring 1996.

During the course of this season, several methods of raising and lowering the portable frames were tested. Method #1: Each frame was fitted with an air valve. By injecting air into the PVC pipe, the frame would rise to the surface (as discussed above). A large amount of compressed air was required to raise each frame making this method impractical. Method #2: A series of four floats, each constructed from two 2-gallon sealed plastic buckets and rope, were attached to each of the 4 corners of a frame. Using ratchets, the frame was slowly raised one corner at a time until it reached the surface. This method proved too dangerous for use. Too many ropes were present and presented safety concerns for the diver using the system. Method #3: One large centrally located float, constructed from four sealed 2-gallon plastic buckets, was fitted with a ratchet to raise and lower each frame. This method reduced the number of ropes needed, improving the safety of this technique. This system provided the best method of raising and lowering the frames. It is recommended that one centrally located 10-gallon bouy with ratches and ropes be used in the future.

Due to the initial success of this method, it is recommended that the frames installed in September 1995 be repositioned in the deep water sites during Spring 1996. The frames should be repositioned at six week intervals throughout the growing season of 1996. Sites cleared of Eurasian Watermilfoil should then be planted with native aquatic plants to lessen the chance of milfoil reintroduction into these sites (see feasibility study below).

STUDY #2: FEASIBILITY STUDY FOR REMOVAL OF MYRIOPHYLLUM SPICATUM AND REPLACEMENT WITH NATIVE AQUATIC PLANTS IN FOREST LAKE, FOND DU LAC CO., WI.

PURPOSE

In 1993, a demonstration project involving the transplant of *Najas* plants from south Forest Lake to the north end of the lake was performed (Gerber, 1993a). New plant growth from those original transplants has been observed for the past two summers. From visual observations using SCUBA, the *Najas* demonstration project appeared to be a success. There was a great deal of volunteer work and manpower required to make the transplanting a success. To decrease the amount of manpower required to plant areas where *Myriophyllum spicatum* (Eurasian Watermilfoil) has been removed, other native plants, which require less manpower to transplant, were tested.

The purpose of this feasibility study was to assess the effectiveness of transplanting *Potamogeton amplifolius*, *P. zosteriformis*, and *Vallisneria americana* into sediments where Eurasian Watermilfoil had been removed. These three native aquatic species were chosen because they are abundant in Forest Lake, provide food for aquatic wildlife, and do not grow to nuisance levels in the lake. These species require much less preparation time prior to transplanting than does *Najas* (Gerber, 1993a).

METHODS

After Eurasian Watermilfoil was removed from the shallow water site using portable frames (see Study #1), plant stems of Potamogeton amplifolius and P. zosteriformis were collected for transplanting into this site. Stems were collected from the east side of Forest Lake (Fig. 2), transported in water to the north side of the lake, and prepared for transplanting by removing dead or damaged leaves. Whole plants of Vallisneria americana were collected from the north end of Forest Lake (Fig. 2) and cleaned. Stems and whole plants were then attached to transplanting frames.

Each rectangular transplanting frame measured 3' X 4' and was constructed from wooden (1.5" X 0.75") slats. Stretched over each frame was a biodegradable coconut fiber mesh (C125BN, Erosion control blanket, GSI GeoSynthetics, Waukesha, WI). Cleaned stems of P. amplifolius were woven into the mesh of 3 different transplanting frames; the same was done for cleaned stems of P. zosteriformis. Tillers and roots of whole Vallisneria americana plants were woven into the mesh. Frames were installed, at a depth of approximately 7 feet in an area cleared of Eurasian Watermilfoil. Rocks were placed on the corners of each frame to keep them in position.

A second method was also used to transplant cleaned stems of Potamogeton amplifolius. Stems were weighted with small balls of non-toxic, plasticised clay (Les & Gerber, 1992). These weighted plants were released from the surface and allowed to descend to the sediment. This method of planting is less time consuming and requires less materials than does the transplanting frame method.

PRELIMINARY RESULTS AND RECOMMENDATIONS

The transplanting frames were installed in early August. The plants in these frames were visually inspected in early September. The *Potamogeton amplifolius* and *P. zosteriformis* plants in the frames were yellow and appeared to be dying back. This is characteristic of transplanted *Potamogeton* stems. The stem tissue dies while roots and tillers are developing. New plant growth comes from the roots and tillers being produced. To determine the success of the transplanting, visual inspection of these plants should be conducted in Spring 1996 after the plants have had a chance to grow. A comparison should be conducted between the transplanting frame method and plasticized clay method of installing plant stems. Should there be no visible difference between the two methods, the plasticized clay method represents the most time efficient and cost saving method. Should the frame method provide the best installation method, it is recommended that more frames be built and installed in the areas cleared of Eurasian Watermilfoil.

REFERENCES

Gerber, D. T. 1993a. Experimental planting of Najas in Forest Lake, Fond Du Lac Co., Wisconsin, USA.

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Kendziorski, C. 1995. Aquatic plant management for control of monocultural stands "islands" of Eurasian Milfoil on Forest Lake, Fond Du Lac County.

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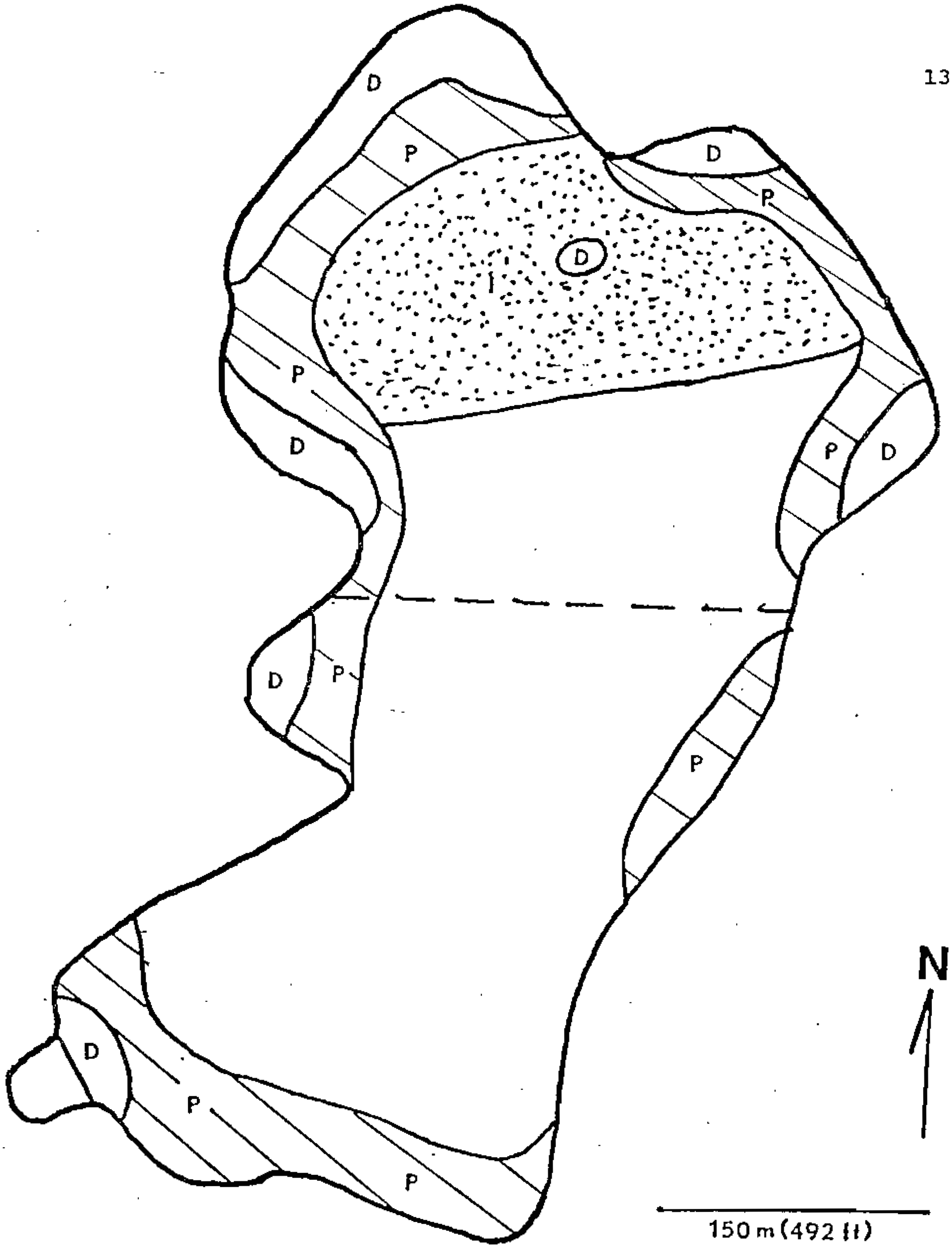


Figure 1. Distribution of Myriophyllum spicatum (Eurasian Watermilfoil) in Forest Lake. Areas with dense (D) or patchy (P) stands of vegetation are shown. "Islands" of dense milfoil are located in the stipled area (I). Taken from Gerber, 1993b.

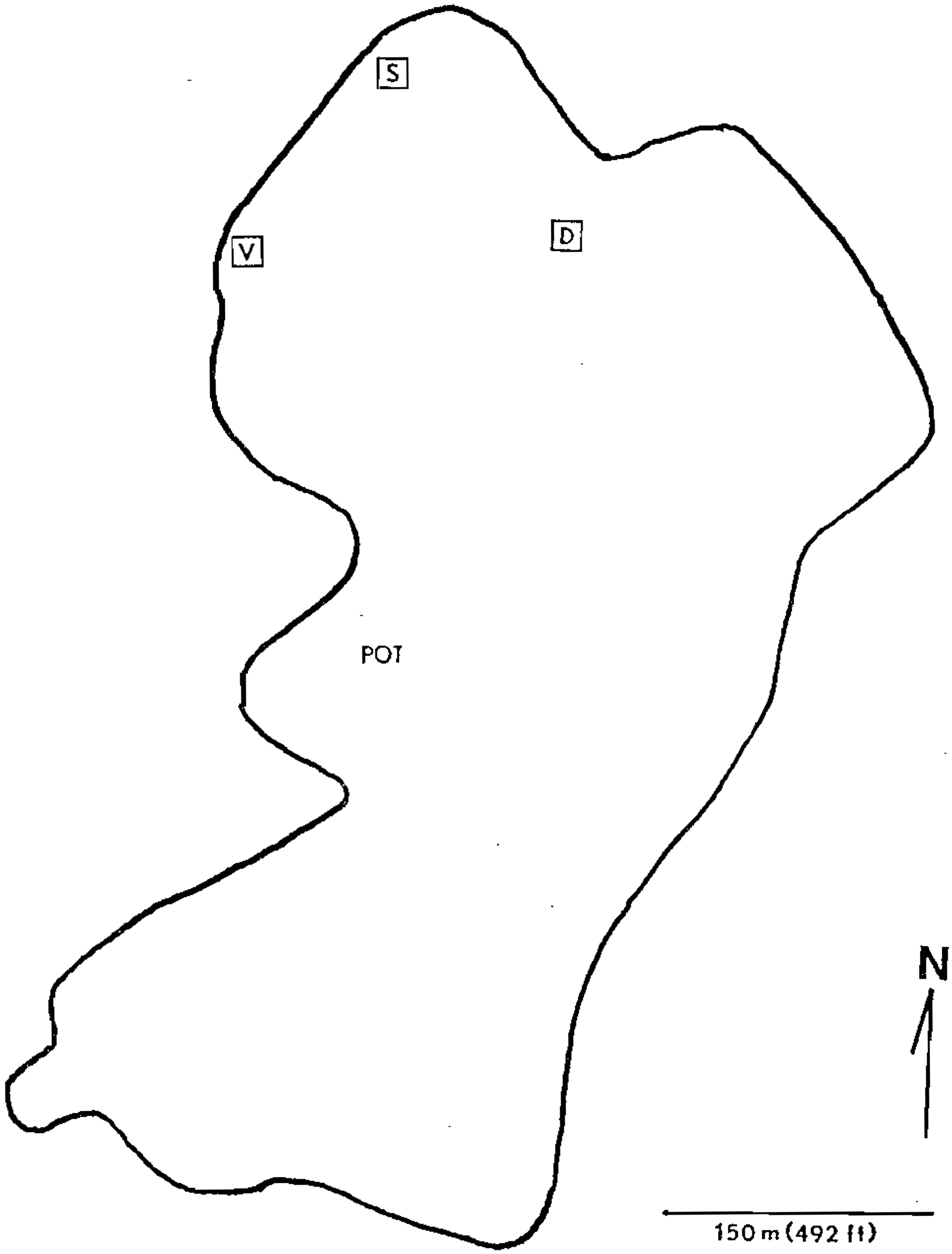
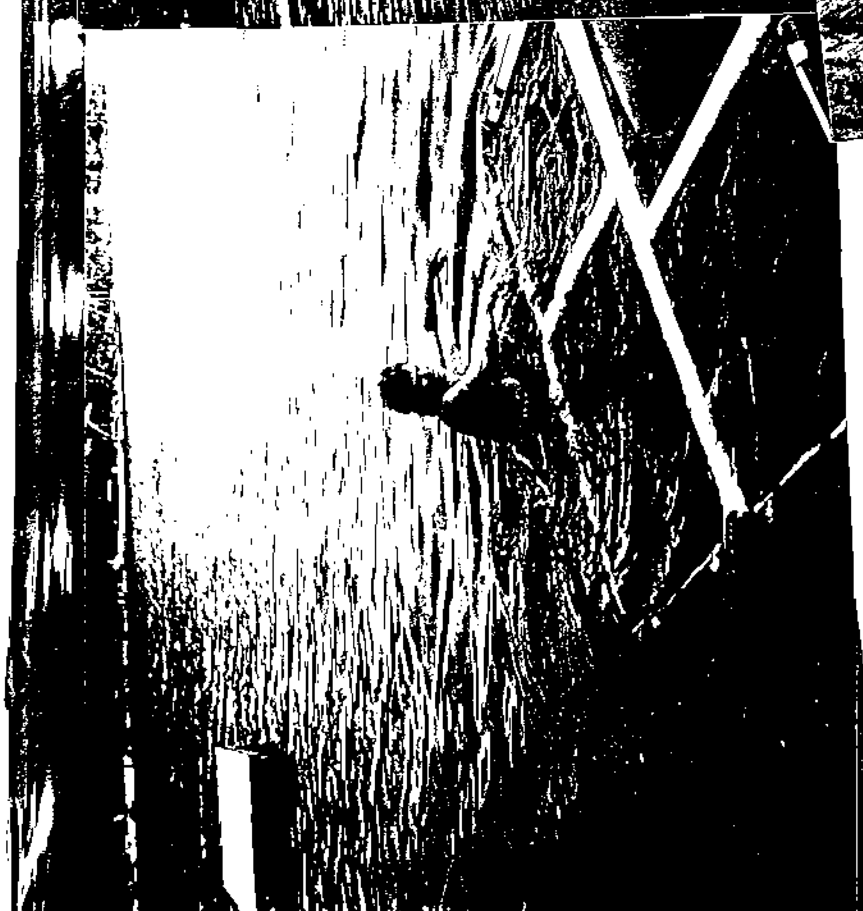
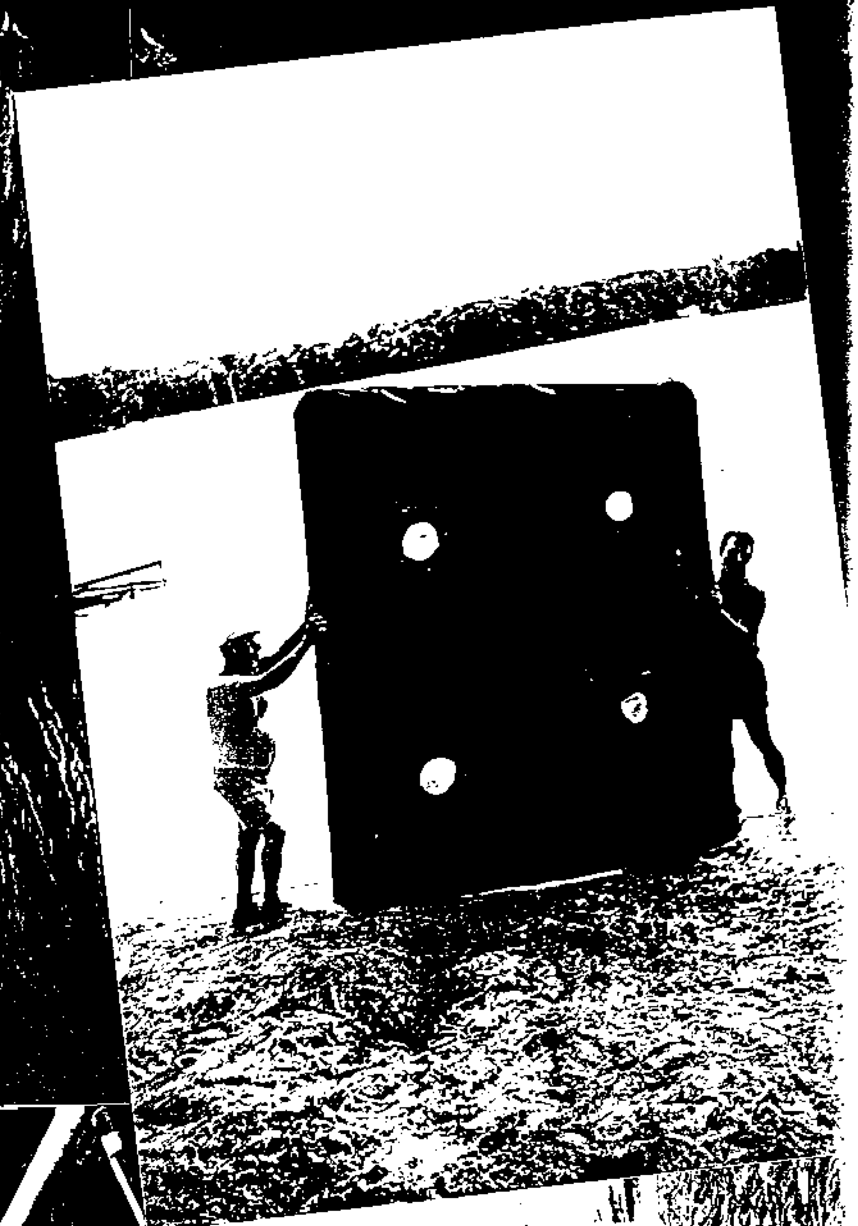
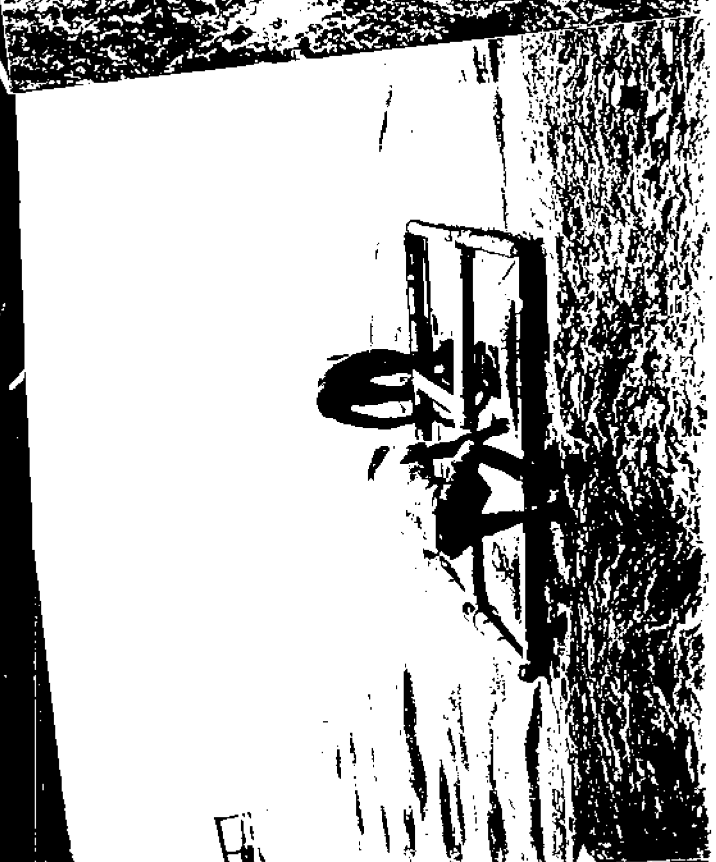


Figure 2. Shallow (S) and deepwater (D) sites where frames were used to kill Eurasian Watermilfoil. Areas of Forest Lake where <u>Potamogeton amplifolius</u>, <u>P. zosteriformis</u> (POT) and <u>Vallisneria americana</u> (V) were collected.

EXPERIMENTAL PLANTING OF *NAJAS* IN FOREST LAKE

FOND DU LAC CO., WISCONSIN, USA

JULY 1993

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PURPOSE

The purpose of this demonstration project was to assess the effectiveness of transplanting Najas flexilis into areas where Myriophyllum spicatum (Eurasian watermilfoil; here after termed milfoil) had been removed.

METHODS

Three areas on the north side of Forest lake, heavily infested with milfoil, were chosen as treatment and transplanting sites (Fig. 1). Each treatment site measured 4 m X 7 m. Three treatments, one treatment per site, were used to remove the existing milfoil. (1) A hand held aquatic weed cutter was used to remove milfoil. (2) Two sheets of Aquascreen (a benthic barrier) measuring 2.5 m X 7 m per sheet were attached to segments of rebar. The screens, installed 40 days prior to a predetermined transplanting day, were placed on top of existing milfoil vegetation and weighted down on to the sediment with cement cylinders (one at each corner). Plant material was collected to determine initial density. (3) A granular herbicide (Riverdale 2,4 D Granules) treatment was applied by hand at the rate of 50 lbs/5000 ft^2 two weeks prior to a predetermined transplanting day.

After each treatment was completed a 2 m X 5 m transplanting site was located within each treatment site in approximately 2.5 m of water depth. Within each transplanting site, a grid of 10

($1\ m^2$) squares were located on the sediment and marked with flags. Three sediment samples were collected within the transplant site and sent to the University of Madison soil testing lab for % sand, % silt, % clay, and organic matter content analysis. The treated area around the transplanting site was a control area.

Plant "plugs" were prepared for transplant into each site. Each plug consisted of an approximately 50/50 mixture of *Najas flexilis* and *Chara* spp. and the sediment in which they were growing (see fig. 1 for collection site). *Najas* plants were collected in early July and were approximately 20 cm in length. Each plug was placed in a cheese cloth sheet with some stones, tied with string, and placed in water for transport. At the transplanting site, the plugs were placed on the sediment at a density of 16 plants per m^2.

PRELIMINARY RESULTS

The plant plugs were installed on the sediment surface at the above density in the hand cleared area using SCUBA. Fifty plant plugs were also installed by releasing plugs from the surface in an additional hand cleared area.

The Aquascreen did not eliminate the milfoil in the prescribed time. The average initial plant density (shoots only) was $3264 g/m^2$ weight weight and $221\ g/m^2$ dry weight. After 40 days under the screens, the milfoil shoots appeared green and relatively healthy. Little plant kill was evident. No plant plugs were installed in the screen treatment area.

The herbicide treatment failed to eliminate the milfoil in the prescribed time. The average initial plant density (shoots only) was 3332 g/m^2 wet weight and 272 g/m^2. Approximately fifty plant plugs were installed on the edge of the herbicide treatment area by surface release.

The plant plugs were visually inspected using snorkling equipment on 30 July 1993. Approximately, 33% of the plants, at each transplanting site, appeared healthy. New milfoil growth was found throughout the hand cleared treatment sites.

FUTURE RESULTS AND RECOMENDATIONS

Najas plants are annuals, next years recruitment grows from the seed released the previous year. The density of *Najas* growing in each of the transplant sites should be visually assessed in 1994 to determine the amount of plant recruitment from the seed produced by the plant plugs (planted the previous year). Because little or no *Najas* was found in each treatment area prior to transplanting, most or all of the recruitment will come from the transplants.

Because the mechanical harvesting of milfoil causes heavy plant fragmentation, and because there is a negative feeling towards the use of herbicides (pers. comm. with Casey Kendziorski), I would recommend the use of a benthic barrier (black pond liners or black plastic sheets) to remove milfoil from Forest Lake. Prior to installation of a barrier, the existing milfoil growth should be cut as close to the sediment surface as possible. This may be done with a hand held weed cutter. The milfoil fragments produced from cutting should be removed from the water. The barrier should be installed over the cut plants and weighted down with cement blocks, etc. The barriers should remain in the lake at least one month to 45 days before removal. If plants are going to be installed in the barrier treated area, they sould be planted as soon as possible once the barriers are removed.

The dense milfoil growth in the lake is concentrated into several areas (see fig. 4 in Gerber, 1993). The treated areas in deep water (milfoil "islands") should be replanted with Myiophyllum exalbescens, the native Common watermilfoil found within the lake. The treated areas in shallow waters by the shoreline should be transplanted with Najas because of their low growth habit, if the results from the above experiment show that these plants may be transplanted with success.

REFERENCE: Gerber, D.T. 1993. Aquatic Plant Survey for Forest Lake, Fond Du Lac Co., Wisconsin, USA. July 1993.

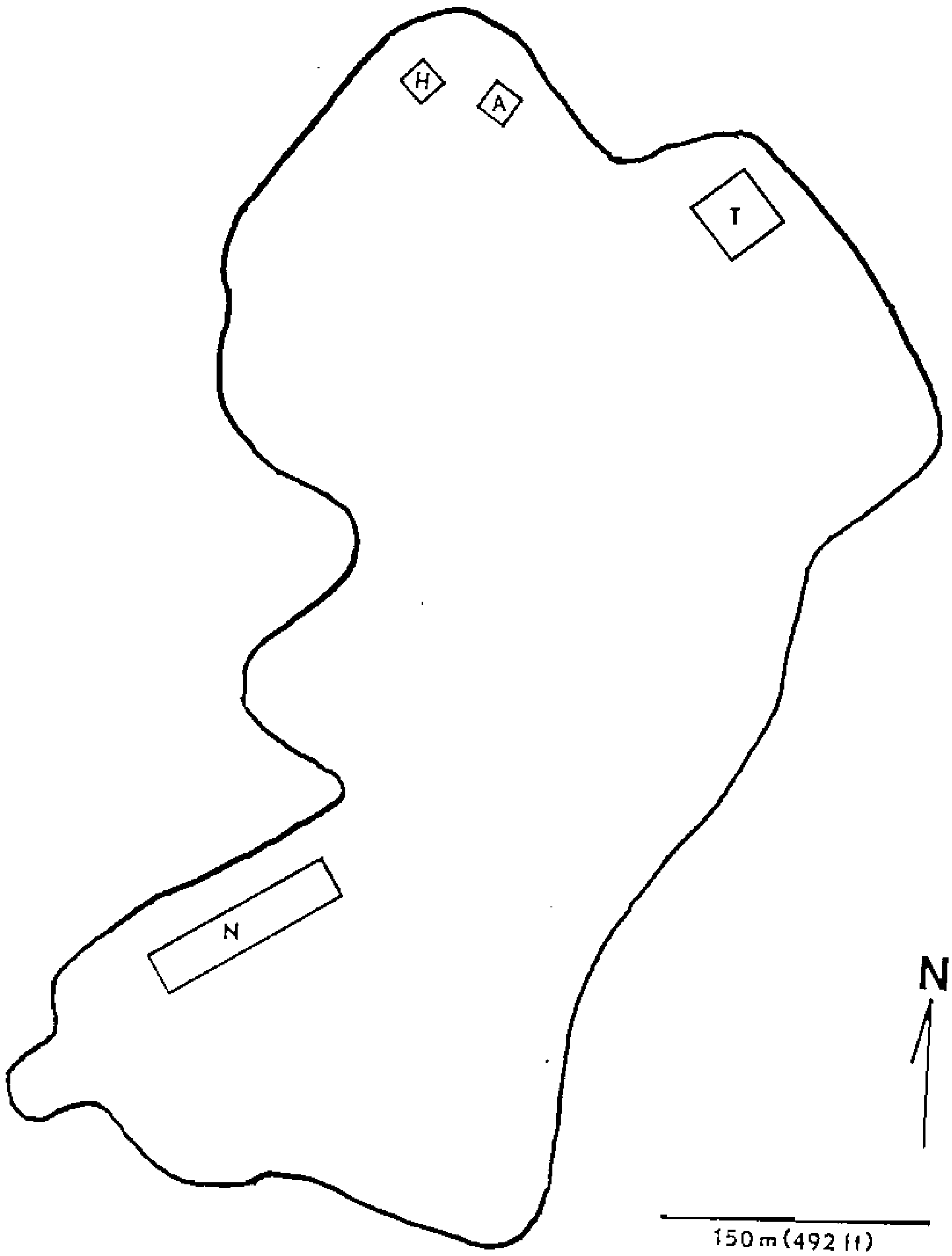

Figure 1. Treatment and plant collection sites in Forest Lake. The hand cleared area (H), Aquascreen area (A), and herbicide area (T) are shown. Najas (N) was collected from the southern end of the lake.