Summary Of Aquatic Weed Survey And Control Data For Volta Lake During 1969[1]

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INTRODUCTION

As has been reported by the USAID Advisor at previous Ghana National Weed Committee meetings, the development of aquatic weeds at Volta Lake has been changing gradually each year since the Lake started filling in 1964.

During the first four years of lake filling, the aquatic weed infestation consisted primarily of floating species, principally *Pistia stratiotes, Scirpus cubensis* and *Cyperus sp.* These floating masses were widespread throughout much of the Lake's margin during the period 1964-67, but have since become more and more restricted to only certain areas.

Also present during that period were the submerged species *Ceratophyllum demersum* and *Utricularia inflexa.* Both species, particularly *Ceratophyllum,* are still abundant.

In 1968, when the lake level reached elevation 275.0 feet (1 foot below the lake's anticipated maximum high) a marginal rooted aquatic weed problem started developing. During 1969 this marginal weed problem, consisting primarily of semi-aquatic weed species such as *Vossia cuspidata, Polygonum senegalens, Alternanthera sessilis* and *Ludwigia leptocarpa,* continued to expand until now most of the Lake's shallow water is infested with these and other plant species throughout most of the year. See the following list of aquatic and semi-aquatic weed species collected at the Lake during recent surveys.

MODE OF SEMI-AQUATIC WEED INFESTATION

Volta Lake's water level fluctuates approximately ten vertical feet each year. The maximum high water level can be expected sometime in early November immediately following the minor rainy season. The low water level normally takes place in June before the heavy rains begin in the northern half of Ghana. These fluctuations are not a natural phenomenon, but are controlled by V.R.A. at the Akosombo Dam. This is done by regulating the twelve flood gates in the dam according to a set plan based on water inflow data and electrical generation demands. Because of the enormous size of the Lake (over 2,000,000 surface acres) the water level fluctuations are very gradual, averaging less than .4 vertical feet per week during 1969. The weekly range was from .1 feet in June to .7 feet in August and September. Gradual fluctuations during the drawdown period allows many species of semi-aquatic plants to become well established on the wet and relatively fertile exposed lake bottom. In many areas of the Lake, particularly along the Afram Plains and in the northern half of the Lake, the land is flat and has as much as a 50 to 1 relief. However it averages less than 30-1 in most areas. This results in a wide (200-500 feet) exposed lake bottom along much of the Lake's shore for several months each year.

When the water level starts its slow rise in June or July many of the semi-aquatic plant species, particularly *Polygonum, Alternanthera, Vossia* and other grasses are already well established and are able to grow faster than the water rises and therefore are not killed by the flooding. This results in a band of weeds (now considered aquatic) being established along the edge of the Lake in water up to 10 feet deep.

Most of the semi-aquatic plant species reproduce by seeds which germinate when they become exposed during the drawdown period. However, some species, particularly *Polygonum* and *Vossia,* also establish themselves very quickly by setting roots from their many nodes when their viable stems wash ashore. *Vossia's* rhizomes also make it well suited for spreading rapidly along the shoreline. Too, *Vossia* can survive quite well while floating free in the water. However, because of the relative infertile condition of the Lake's water mass, it does not seem to grow nearly as vigorously as a free floating plant as it does when it is rooted to the bottom. *Vossia's* highly adaptable nature has allowed it to spread at an alarming rate around the Lake during the past three years and it is expected that it will continue to spread in the future.

IMPACT OF AQUATIC WEEDS

Most warm water lakes contain at least some aquatic plants. Numerous studies have been conducted to ascertain to what extent these plants influence water bodies and their use, and it has been found that in general most species of aquatic plants are beneficial, particularly with regards to fish production. Observations made at Volta Lake by the authors and other workers have indicated that many different types of fish food organisms thrive in these weed beds. These weeds also provide protective cover. However, it has been found that when aquatic plants become *too* abundant they often become more of a liability than an asset to the impoundment. When this happens these aquatic plants are then referred to as "aquatic weeds" and control measures are sought.

Studies conducted at the Lake have shown that some species of aquatic weeds growing around the Lake's margin support high numbers of vector snails that carry *Bilharziasis* (human liver fluke) as well as other disease carrying organisms.

Also, recent surveys indicate that inshore fishing is

[1]This work was carried out under the USAID Volta Lake Technical Assistance Project (641-11-190-028).

being adversely affected by the heavy aquatic weed growth that now exists along much of what is considered to be some of the Lake's most potentially productive fishing grounds.

Furthermore, these weed bands have made it more and more difficult for the motor launches, which are life-blood of many of the remote fishing villages, to properly service these villages. It has been learned that in certain areas around the Lake motor launch captains have refused to stop at some villages that have become too difficult to reach because of the heavy weed infestations. However, this is the exception rather than the rule since most villages, through necessity, have at least cleared small paths through the weeds for the motor launches to pass.

Even though the main overall aquatic weed problem that currently exists at the Lake consists primarily of emergent semi-aquatic weed species, there still exists some areas that are heavily infested with floating islands of aquatic plants. These island masses, consisting primarily of a mixture of *Pistia, Scirpus* and *Cyperus* are generally restricted to the vicinity where the major streams enter the Lake. The reasons for these dense, floating masses being restricted to these areas are attributed to the following unique prevailing conditions.

1. The presence of extremely thick timber and bushes that extend above the water level. This provides a suitable anchorage for holding the weed masses in place.
2. The relatively high nutrient level of the shallow water created by the flooding of fertile river bottom land plus the inflow of nutrient laden water from the rivers during the rainy season.

Where these conditions prevail the areas often become so heavily infested with weeds that they are impossible to penetrate by boat and therefore cannot be considered useful as fishing grounds or for lake transport routes. This condition now exists in the upper end of the Afram River where many hundreds of acres of the Lake's surface are covered, and to a lesser extent in the Pawmpawm River. As stated before, this same general condition exists in other areas where permanent streams enter the Lake, but the problem is not nearly as extensive as it is in the two river systems just mentioned.

AQUATIC WEED CONTROL EXPERIMENTS

Public Health – Ampem Aquatic Weed Control Pilot Project - 1969

This portion of the report covers the period during which a selected 7.3 acre site in front of Ampem fishing village was cleared of all standing vegetation and debris and then treated with a combination of two herbicides, Fenac and Karmex (diuron). See attached diagram.

The primary purpose of this study was to find effective and economical means of reducing aquatic weeds around strategic road-head fishing villages and market centers at Lake Volta in an attempt to reduce the probability of people contracting bilharzia.

Earlier studies have shown that vector snails prefer areas infested with certain types of aquatic weeds. Therefore, it is believed that it may be possible to reduce bilharzia transmission in a given area by making the area less attractive to vector snails.

The actual preparation for this study began in February 1969. Activities, prior to the period covered by this report, included a meeting between V.R.A. and residents of the Ampem fishing village to explain the proposed program, selecting a suitable site for resettling the villagers above the anticipated maximum water level and setting a date for their self-imposed evacuation.

By mid-April most of the villagers had moved to a new ten acre site located immediately above their original location.

After the area was evacuated, the size of the area to be cleared and treated was determined.

Based on the amount of Fenac that was available for the study, a maximum of eight acres could be treated. Therefore, the dimensions of the test plot was determined by measuring the distance from elevation 265 feet (the anticipated maximum low retention level) to a marker accurately placed at elevation 278 feet (two vertical feet above the anticipated maximum high retention level of 276 feet). The water level at the time of treatment was 265.8 and slowly falling. Based on this information, it was determined that the length of the plot should be 800 by 400 feet which gave a plot size of approximately 7.3 acres. This gave 400 feet on each side of a road that leads to the waters edge and where most human activity takes place, particularly on market days.

In early April 1969, Mr. C. A. Dadey, Chief, Agriculture Officer of V.R.A., instructed the Agricultural Assistant at Ampem to provide the necessary heavy farm equipment and personnel to clear the designated test site and assist in making the actual herbicide treatment. V.R.A. also provided other equipment and supplies that were not available at Ampem. This equipment included:

1. Chain saws for cutting down large trees growing on the site, and cutting up large dead trees that had washed to shore during past high water periods.
2. Large steel cables for dragging the cut-up logs to a central location above the 280 foot mark.
3. Axes for cutting down small woody bushes and trees and for removing stumps.
4. Cutlasses for cutting down the remaining vegetation.

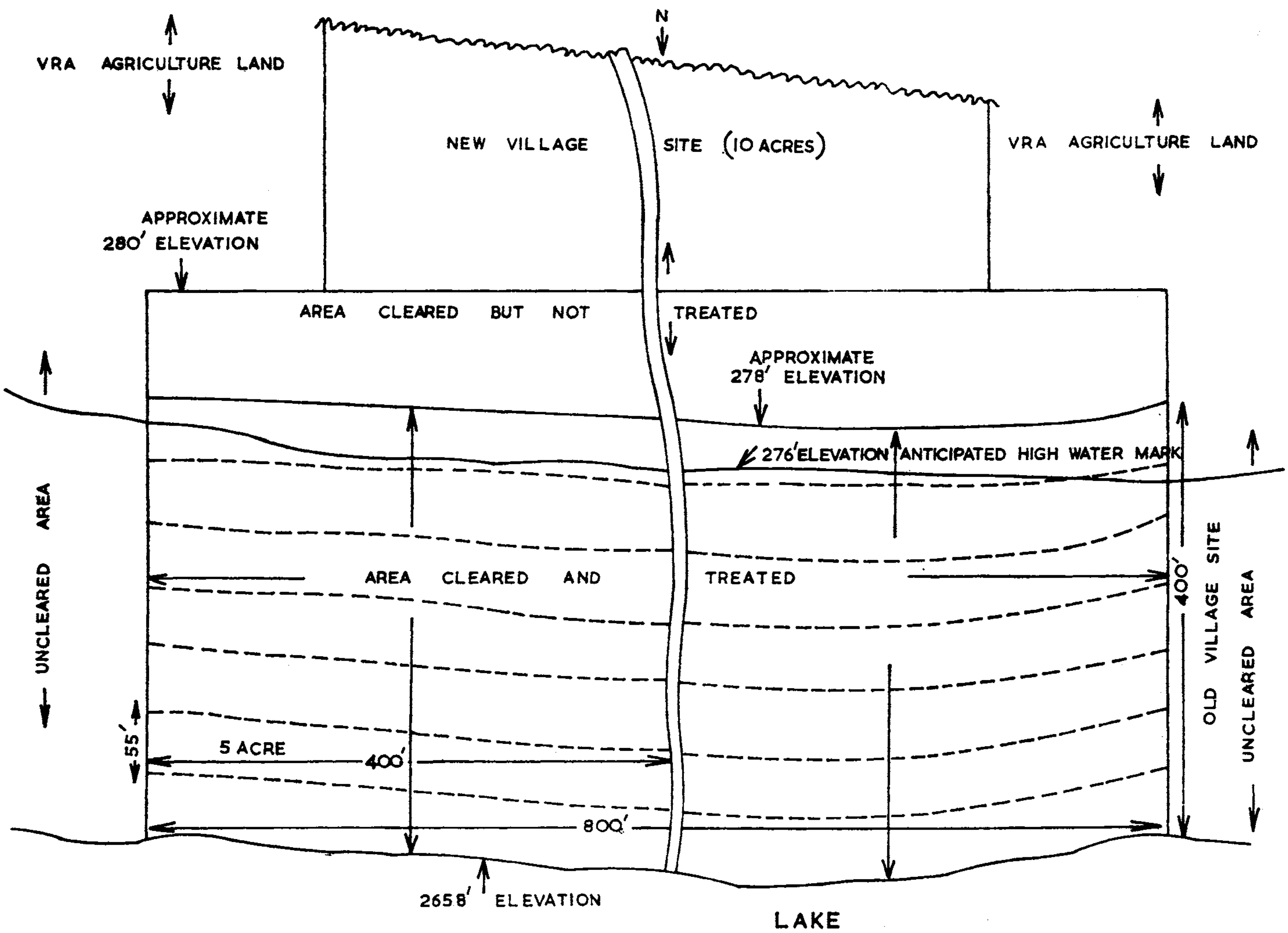
It was agreed that local people would be hired to do the manual labor. Therefore, arrangements were made to to hire six men from the Ampem Resettlement village located approximately .5 miles away from the test site.

LAND CLEARING

The clearing operation took fourteen working days during the period April 28, May 13, 1969. Initially, all of the small bush clearing was scheduled to be done by the six laborers. However, this proved unsatisfactory because they worked too slowly. Therefore, mechanical clearing using heavy farming equipment was tried.

An attempt was made to clear the area using a disc plow, disc harrow and a spring cultivator, but these proved unsatisfactory because they left too much vegetation and would encourage erosion during periods of heavy rain. Finally, a multi-purpose blade, designed for minor land leveling and road maintenance, was located and proved relatively effective in scraping the area clean of vegetation and debris. This method was also slow, but appeared to be much faster than using manual labor. Therefore, the laborers were instructed to utilize their time in clearing the stumps and bushes from areas that could not be cleared using the tractor and blade. Once this was done the vegetation and debris were placed in piles and burned. That

AMPEM AQUATIC WEED AND SNAIL PILOT PROJECT



portion of the wood that was large enough to be used for firewood was given to the local villagers. Other clearing included the leveling of old smoking ovens used by the villagers when they occupied the site.

SPRAYING PROCEDURE

In the evening of May 19, 1969, the area to be treated was marked off into small (one-half acre) sections measuring 55 x 400 feet to assure complete and uniform coverage. In order not to disrupt the area's commerce and normal day to day activities any more than necessary, it was decided that one-half of the area would be treated on May 20 and the other half on May 22. May 21 was market day. Therefore, the east side of the road was treated first and the people were instructed to use the untreated area on the west side. On May 22, they were requested to use the east side that had already been treated. Unfortunately only a small portion of the west side of the road could be treated until the morning of May 23. The reason for this is explained later in this report.

EQUIPMENT AND MATERIALS

1. A four wheeled flat bed trailer pulled by a M.F. "165" tractor and also a large lorry.
2. A John Beam Spray-pump, model 101CK equipped with a Spray Master spray gun nozzel and a number 6 disc.

Two spray tanks made from used 55 gallon drums.

4. Eighty gallons of Fenac containing 1.5 lbs. acid equivalent per gallon.
5. Thirty pounds of Karmex (80% Diuron) wettable powder.

The two 55 gallon spray drums were placed on the trailer along with the motor-driven spray pump. The trailer was then backed into the Lake and the drums were partially filled (30 gals.) with water. The trailer was then pulled to a central location where the chemicals had been placed. The herbicides were measured out and mixed with the water in each spray tank. The quantity of each herbicide was based on the amount required to treat one-half acre. Therefore, the mixture was 5 gallons of Fenac plus 2.5 pounds of Karmex mixed in 30 gallons of water. The powdered Karmex was mixed with the water before the Fenac was added. During the latter part of the second day of treatment the mixture was changed to 2.5 gallons of Fenac plus 1.25 pounds of Karmex mixed in 30 gallons of water in order to wet the ground more thoroughly. This was not necessary on the first day because it had rained heavily the night before. Nor was this increased wetting necessary when spraying near the edge of the Lake where the soil stayed moist.

This mixture gave fifteen pounds of Fenac (acid) and four pounds of Diuron (acid) per surface acre. Earlier studies had shown that this concentration was satisfactory for controlling vegetation at the Lake.

After the chemicals had been mixed in the drums the trailer was pulled to the east side of the road to the one-half acre plot nearest the waters edge. The pump was started and allowed to build up 300 pounds of pressure. When this pressure was obtained the tractor driver was instructed to drive slowly down the plot staying an equal distance between the 55 foot markers. As the tractor moved slowly along at about 1 mile per hour, one man walked directly behind the trailer while spraying the designated area. The hose attached to the sprayer was 25 feet lang, therefore, it was easy for the 55 foot swath to be covered since the distance from the center where the tractor-trailer was travelling and the edge of the plot was only 27.5 feet. The spray-stream can carry at least 30 feet when using the number 6 spray nozzel disc at 200 to 300 lbs. pressure. Since the pump was putting out approximately 9 gallons of spray solution per minute it took approximately 20 gallons of the 30 gallons to cover the area on the first pass. Therefore, the tractor-trailer was turned around and the area was re-sprayed while the tractor travelled twice as fast. This used up the remaining 10 gals. of spray solution. This procedure was repeated for each one-half acre plot until all of the fourteen one-half acre plots were treated.

The area was re-visited on May 28 and 29, 1969, to determine how effective the treatment had been. Virtually all of the seedling plants were dead. However, several clumps of terrestrial wire-grass were still alive. Also, a few small spots, that had apparently been missed, were still green. These areas were retreated with back-pack sprayers.

SIX MONTHS AFTER TREATMENT

During the initial flooding some *Ceratophyllum* was growing offshore in the shallow water immediately in front of the cleared area. However, by mid-September when the water level reached 270 feet elevation very little stationary *Ceratophyllum* could be found growing there, or within the treated area. However, large quantities continued to grow in the shallow water *outside* the experimental plot. The lack of anchored *Ceratophyllum* immediately in front of the treated area after mid-September was attributed to excessive water depth, since this species was also found to be absent at comparable depths in other areas of the Lake. However, in several protected areas where the water was extremely clear, the authors found *Ceratophyllum* growing to a depth of 10 feet.

At no time during the flood period did rooted aquatics show any sign of becoming established within the treated area. This was in contrast to the adjacent untreated shoreline areas which became extremely heavily infested with a variety of aquatic weeds intermingled with debris.

However, debris that washed ashore within the cleared area, particularly fragments of *Ceratophyllum* and *Polygonum,* caused some concern since *Polygonum* was found to be rapidly setting roots, and some of the *Ceratophyllum* fragments contained snails. When this was first noted, project personnel with the occasional help from local fishermen, removed the wind-rowed debris as it accumulated. This clean-up exercise took place weekly or as needed and usually required only a few man hours each time. It was quickly learned that the major debris problem was not caused by the wind and wave action bringing the debris (mostly *Polygonum*) ashore, but from fishermen who discarded *Polygonum* stems and leaves along the cleared shore after they had used them for covering their fish to keep them fresh.

These fishermen responded favorably to our request not to discard these weeds next to the waters edge within the cleared area. This action immediately reduced the amount of debris along the 800 linear feet of cleared shoreline.

In addition to *Polygonum* and *Ceratophyllum* the other main forms of debris consisted of large tree limbs, sticks and floating islands of *Scirpus, Cyperus* and *Pistia*. The tree limbs that were too large to be carried away by hand, were left in the water. However, in several instances large floating limbs were towed away by boat to an area outside the test site. All in all these tree limbs did not present a serious problem during the study period. Had they developed into a problem, arrangements had been made to have them dragged out of the water with a tractor and cable.

The floating islands presented more problems than did the tree limbs, since they became rooted soon after they washed ashore. Also, these islands were found to carry vector snails. Normally the islands were small and could be easily torn apart and removed. However, occasionally a large island would float ashore, necessitating much more work in removing it.

With the exception of a few "snags" that were left during clearing, the lake bottom within the cleared area is relatively clean, flat and rather firm. This has resulted in it becoming a favorite place for the local people to swim and fish with cast-nets.

EROSION

It was obvious that some erosion would be encountered on the denuded 7 acre plot during the rainy season. However, it was interesting to note that no "gullies" developed even though some sheet erosion was experienced. This resulted in large quantities of organic debris, particularly small pieces of burned wood and etc. being wind-rowed along the waters edge. This was probably the result of the vegetation that was burned on the area during the clearing operation. However, this type of wind-row is common along most of the Lake's shore during the initial part of the rainy season when the loose, partially burned bush-remains wash into the Lake. Wave erosion was not serious at Ampem during the past six month filling period, even though this area does receive relatively heavy wave action.

EFFECT ON SNAIL POPULATION

As was mentioned earlier in this report, the main purpose of this study was to determine what impact this weed-free area would have on the snail population within the test site. However, it should be clearly understood that this study was not designed to determine what effect this snail reduction would have on reducing bilharzia infection, since no one assigned to the weed control team is qualified to assess this. It was originally thought, however, that the World Health Organization (WHO) team assigned to the Volta Lake Research Project (V.L.R.P.) would be in Ghana prior to, or soon after, the treatment was made, and that they would be able, if they so chose, to make this assessment and to determine the practicability of this indirect approach to bilharzia control. Unfortunately, the WHO team did not arrive until December 1969 which was seven months after the treatment.

In mid-January 1969, Mr. Ambrose Tsiko of the Volta River Authority (V.R.A.) Health Unit conducted a pre-treatment snail survey of the proposed treatment area. The survey also included taking samples outside the experimental plot for comparison. The water level at that time was at elevation 272 feet and falling.

During this survey a total of 8 *Bulinus forskali* and 30 *Bulinus truncatus* snails were collected within the treatment site compared with 1 *B. forskali* and 15 *B. truncatus* found immediately outside the proposed site.

As the water level receded, between January and the time of treatment in late May, additional spot checks were made to determine the relative abundance of snails. By the time the water level dropped below elevation 266 feet most of the emergent marginal weeds were exposed, leaving a more or less weed free mud-flat along the shore. Even *Ceratophyllum* was limited in quantity at that time and was only found to be abundant in several small sheltered coves. Correspondingly, the snail population was extremely low along the shoreline except for the coves which had extremely high snail populations; relatively speaking.

Another thorough snail survey was conducted by Mr. Tsiko and the weed control staff in November 1969, six months after treatment and when the water level was at elevation 274.8 feet. The maximum water level recorded during 1969 was 275 feet which occurred on October 15 and again on November 8.

Two areas measuring 12 x 48 feet each, were sampled within the treated area, and two areas of similar size were sampled in the untreated area located immediately on each side of the cleared area for comparison.

At the time of sampling virtually no aquatic weeds or debris were present within the treated area.

Only *one* snail (*Bulinus truncatus*) was found within the treated area and it was found on a piece of *Ceratophyllum* floating into the area from outside.

However, the uncleared areas, comprised of a heterogeneous growth of aquatic weeds and debris, were heavily infested with snails. The primary aquatic weed species found growing within the sampled uncleared areas were:

Polygonum senegolense
Ceratophyllum demersum
Pistia stratiates
Ludwigia leptocarpa
Lemna sp.

From the two uncleared areas sampled, a total of 98 *Bulinus truncatus* and 112 *Bulinus forskali* were collected. The snails did not appear to show a particular preference to any one species of plant, and many snails were found on the algal covered debris.

CONCLUSIONS

Therefore, from these studies it is concluded that the clearing operation was effective in reducing the areas attractiveness to snails. It is these authors opinion that the noted reduction in the snail population within the cleared area during the flood period had absolutely nothing to do with the difference in the availability of food, but was primarily due to the lack of sufficient protective cover from preditors and wave action, and the virtual absence of a suitable stratum for depositing their egg masses and for movement in general. Observation will continue during this current draw-down period. However, all future weed work associated with snail control will be co-ordinated with WHO – V.L.R.P. personnel working at the Lake.

FISHERIES AND SMALL LAKE TRANSPORTATION

As stated earlier in this report, the shoreline aquatic weed problem has been found to be interferring with normal inshore fishing activities and is causing increased difficulties for the motor launches to service many villages around the Lake.

It is known that these weed beds support large quantities of fish when flooded. It is also known that prior to the Lake's margin being infested with these aquatic weeds, many commercially important fish species moved inshore to feed at night and returned to the protection of the deeper offshore water during the day. The fishermen, therefore, found it effective to set their gill nets parallel to shore in water less than six to eight feet deep to take advantage of the fishes predictable diurnal movement. Now that much of the lake's margin is covered with flooded aquatic and semi-aquatic weeds during most of the year, the fish have accordingly changed their habits. Because of the cover the aquatic weeds provide, the fish apparently do not find it necessary to leave the shallow water during the day. Therefore, with the exception of a few species, the fish more or less stay within the flooded weeds both day and night. This is not to say that they are no longer highly mobile, but their movement is now primarily horizontal within the confines of the weed beds and not perpendicular to shore as before. This has created new problems for the fishermen, resulting in their catching fewer fish inshore except during the periods when the water level is sufficiently low and the weed beds are relatively narrow. The rest of the time the water depth along the outside edge of the weed bed is too deep for the nets to be very effective. Also, the weed beds are so dense that it is virtually impossible for a fisherman to set his nets properly since the amount of vegetation below the water is often greater than what is above the surface. With few exceptions, no fishermen have made any effort to clear fishing areas for setting their nets in the weeds. This is primarily because most of the indigenous fishermen are not accustomed to fishing where extensive weed beds exist. One phase of the USAID, Volta Lake Technical Assistance Project is to assist the fishermen in making this necessary transition by demonstrating, through self-help initiative, effective ways and means of clearing fishing areas along the Lake's weed infested shoreline.

TEST RESULTS AND FUTURE PLANS

Spot clearing aquatic weeds is extremely diffcult in water deeper than six feet when using chemical herbicides, manual or mechanical means. However, since the Lake level fluctuates significantly each year, it was found that if strips were cleared during the drawdown period when the maximum of lake shore was exposed these strips would stay sufficiently free of aquatic weed growth during the following flood period to allow gill nets to be fished effectively among the flooded weed beds.

During the past drawdown period eighteen such weed control experiments were conducted near Ampem using five different herbicides and their combinations under three separate conditions. These conditions were:

A. Treating standing vegetation
B. Treating area after the vegetation had been cut down but *not* removed.

C. Treating area after the vegetation had been cut down *and* removed.

The size of each plot measured 10 x 100 feet starting from the water's edge and running at right angles to the shoreline.

Herbicides tested consisted of:

2,4-D amine (liguid and granules)
2,4-5-T ester (liquid)
Diuron - (80% wettable powder and granules)
MCPA - (liquid)
Paraquat - (liquid)

From these preliminary tests several general conclusions can be made:

1. Treating tall standing vegetation is impractical since adequate coverage is very difficult and therefore not satisfactory.
2. Better control was noted when the area had been cleared of vegetation, treated and then the cut vegetation placed back upon the area (technique "B" above).
3. Diuron, MCPA and 2,4-D amine liquid were more effective on *Polygonum* and *Alternanthera* than the other herbicides tested.
4. Regrowth was sufficiently rapid to close each of the test areas within six months after treatment, if it was kept clear by regular use.

It was interesting to note that technique "B" was the most effective since this indicated that possibly the shading effect of the cut vegetation assisted in the control. Therefore, it is believed that it may be possible to effectively clear areas by manual labor alone if the cut material is of sufficient quantity to completely cover and shade the ground where the strip is to be located. The dead material will probably have to be removed prior to flooding, however. The burning of the material immediately prior to flooding may also provide additional weed growth suppressing.

During 1970 plans have been made to clear approximately 100 of these fishing strips at Volta Lake using both chemical herbicides, manual labor and the combination of the two. Fish catch data will be collected from these strips to determine the effectiveness and the feasibility of such a program.

Opening motor launch lanes in the weed beds will be conducted in the same manner, but on a larger individual scale.

Chemical Company	*Herbicides Donated*
1. Amchem Products, Inc. Ambler, Penn. 19002 U. S. A.	Fenac (2,3,6, trichlorophenylacetic acid) Aqua Kleen Granuler (2,4-D)
2. E. I. DuPont De Nemours and Company, Inc. Wilmington, Del. 19898 U. S. A.	Karmex 3-(3,4 dichlorophenyl)-1, 1-dimethylurea
3. Florida Agric. Supply Co. (FASCO) Jacksonville, Florida 32201 U. S. A.	Cardi 20% diuron pellets
4. ICI (Export) Ltd. P. O. Box 104 Tema, Ghana	Gramozone (Paraquat) Triozone 50 (2,4,5-Tester) Fermimine (2,4-D Amine)
5. Monsanto P. O. Box 5381 Accra, Ghana	2,4-D Granular Weed Killer
6. Shell Company of Ghana Ltd. P. O. Box 1097 Accra, Ghana	Shell D-50 (2,4-D) Shell T-50 (2,4,5-T)

Aquatic and Semi-Aquatic Plant Species Collected at Lake Volta During Recent Surveys* - **

Alismataceae
  Burnatia enneandra
Amaranthaceae
  Alternanthera sessilis
Araceae
  Pistia stratiotes
Ceratophyllaceae
  Ceratophyllum dermersum
Cyperaceae
  Cyperus articulatus
  Fimbristylis dischotoma
  Scirpus cubensis
  Scirpus praelongatus
  Torulinium confertum
Gramineae
  Echnochloa pyramidalis
  Echinochloa stagnina
  Oryza barthii
  Sacciolepis africana
  Sorghum arundinaceum
  Vetiveria fulvibarbis
  Vossia cuspidata
Hydrophyllaceae
  Hydrolea glabra
Lemnaceae
  Lemna
Lentibulariaceae
  Utricularia inflexa
Marantaceae
  Thalia welwitschii
Najadaceae
  Najas baldwinii
Nymphaeaceae
  Nymphaea micrantha
Onagraceae
  Ludwigia erecta
    (previously Jussiaea erecta)
  Ludwigia leptocarpa
    (previously Jussiaea leptocarpa)
  Ludwigia stolonifera
    (previously Jussiaea repens)
Polygonaceae
  Polygonum senegalensis
Salviniaceae
  Salvinia nymphellula
Sphenocleaceae
  Sphenoclea zeylanica

*Determinavit: A. A. Enti, Botany Department, University of Ghana, Legon.

**This list is by no means complete, but only contains those species that have been verified by the above botanist.