# DARTFORD AND DISTRICT ANGLING AND PRESEVATION SOCIETY 

PROPOSED MANAGMENT PLAN 2016
Foreword ..... 2
Management Plan 1998 ..... 3
Introduction ..... 4

- The Need for Site Management- The Anglers
Horton Kirby \& Sutton at Hone Angling Census6- Angling Census: Horton Kirby
- Westminster Field Lake
- Viaduct Lake
- West Lake
- Silt Pond
- Conclusions- Angling Pressure- Angling Census: Sutton at Hone
- Sutton Big Lake
- Sutton Small Lake
- Conclusions
- Pressure
- More Water
Stocking / Stock Levels ..... 10
- General Purpose Fisheries
- Species Specific Lakes
- Numbers of Fish
- Predator/Prey Balance
- Fertile?
- Conclusion
Habitat Management ..... 14
- Habitat Improvements
- Water Control
The West Lake ..... 16
- Conclusion
- Golf Course
The Silt Pond ..... 18
- The Plan
- Conclusion
The Future ..... 19
References ..... 20
APPENDICES ..... 21
- Thames Water 1979 DDAPS Report
Proposed Plan 2016 ..... 35


## Foreword

Over the last forty years the Society has changed drastically in regard to the types of angler that make up its membership and what they expect to catch from Society waters.

The vast majority of the members who fish our venues primarily fish for carp. In a survey carried out between April and December of last year, this was found to amount to $89 \%$ of our membership. Pleasure anglers account for $9.6 \%$ of our membership, while match and pike anglers each account for $0.7 \%$. There are a variety of different possible sub-groups that can be traced within the carp angling group. There are those that focus primarily on the number of fish they catch, paying little attention to their size. There are those that focus primarily on the size of the fish, taking no interest in the numbers and prepared to wait all season for the right opportunity. In between, there are those that sit between these two extremes, looking to catch a respectable number of good-sized fish.

The Society has always had a rich tradition of match fishing since its foundation, but interest in this side of the Society's activities has declined significantly in recent years. Very few young anglers are taking up this type of angling at present and, unpleasant as it may be to consider, combining this with the high average age of the Society's regular match anglers leads to the conclusion that the decline will continue for the foreseeable future. It would be a sad thing for the Society if this side of its activities were to disappear, as has already happened in so many other clubs, but, if we sit by and do nothing, this is inevitable.

It is our belief that with careful management of all of our venues we can supply a variety of types of sport that will suit all of our members. It is our wish to put in place a management plan to help us achieve these goals.
We are trying to look ahead to where we want our Society to be in 5-10 years. The only way we can achieve these expectations is if we start managing our waters and following the advice we have paid for and received over the last forty years.

We have included a copy of a management plan that was presented to the committee in 1998. Although the figures of the angling census have changed and the number of match anglers has declined, the management plan remains as relevant today as it was in 1998. The 1998 management plan also includes information and advice on a prior plan and survey presented to the committee in 1979, which is also included here. Neither of these recommendations were acted upon at the time. It is our intention to formulate a new management plan, based on these recommendations, that we can use to achieve our goals for the future.

Clive Archer

# Dartford and District Angling and Preservation Society 

Management Plan 1998<br>Horton Kirby and Sutton At Hone

## Introduction

This management plan is set out so that each lake will eventually have a separate chapter, each with its own objectives and problems. Some of the problems will be universal as the habitat dictates. The overall objectives of this management plan is to achieve sustainable stocks of the species that live in the lakes and to upgrade the general sport for the members.

## The Need for Site Management Plans

1) Lakes used as fisheries are constantly changing and these sites used by the members/public need constant management in order to maintain and help the species to flourish.
2) Management decisions cannot be made if there are no objectives for the use of each individual water.
3) To justify the expenditure of the members' moneys and limited resources, to manage cost effectively with tangible benefits.

The management of the lake involves:

- Understanding each lake's natural ecology - although this is limited by the variation in habitat.
- Understanding how species adapt with other, more dominant, species.
- Identifying the broad goals.
- Identifying the management needed to achieve them - i.e. work programmes and projects.
- The means to determine progress towards achieving the objective so that resources of cash, labour and skills are being used efficiently.


## The Anglers

Te first and foremost question asked is "What do our members want from their fishing?". There is a different answer from every angler because each individual has their own opinion on what makes a god day's sport. Without knowing the answer to this simple question it is impossible to set out any clear objectives to achieve.

What species are already in the lakes and how do they relate to one another? Are they recruiting in sufficient year classes to maintain the correct balance and are they growing to the size modern day anglers expect? These two questions alone cannot be left to hearsay. We need hard facts and evidence in order to set out our objectives.

Because angling is everything to everybody, it is one of the most difficult factors to quantify when considering the future management of a site. Today's commercial fishery has a simple task of setting their stalls to the trend of today's anglers' needs, but with over 2500 members, it is simply impossible to please everybody, so we need to define the type of angler that uses our waters most and what they expect from that day's angling.

Today, more than any other time in angling history, anglers can be categorised by the species of fish and the methods they used to catch them. There are many anglers that will disagree with this, but how many of them could say that angling shops 20 years ago could make a tidy living from simply selling carp tackle?

At the end of the day, each angler fishes for pleasure, whether it is fishing in a match against other anglers or spending a week sitting under a bivvy waiting for a carp or pike. It does not matter whether the individuals think the others are mad! The main point is that we are all anglers at the end of the day. The main difference between angling today and 20 years ago is today's angler expects a great deal more from his sport and this is where the average fishing club is coming unstuck.

Increasingly anglers have more money to spend on their chosen quarry and a better choice of venues to fish. Modern day transport and the increase in car ownership enables anglers to travel greater distances and today's commercial fishery is catering for today's tastes.

There are no definitive facts on whether anglers are dropping out of club angling in favour of these commercial owned waters but it is logical to conclude that, at some time, most anglers will be tempted away and spend £810 on a day ticket once or twice a season and improve their chances of catching a bag of good sized fish rather than struggling all day on their club water only to be rewarded with a few small roach and bream. It is very likely that a percentage of these anglers will drop out of their club, especially if they only fish for a couple of days per year.

Therefore it is vitally important that today's angling clubs wake up and find a halfway house between the barebanked commercial fisheries and yesterday's memories of what angling used to be like on their club waters. Angling clubs have the added bonus of being able to supply security, aesthetic surroundings, solitude as well as the club camaraderie. It is my opinion that the clubs that recognise the difference in what anglers expect today and what they used to expect will be the ones which survive best into the new millennium.

So, without knowing the answer to this question, we cannot set out the list of objectives to achieve and the lakes will continue to be under managed and under valued by the membership. The vast majority of anglers know what species they want to catch the night before they go fishing. They will take specific tackle and baits and always chose the best possible swim and lake to improve the odds on catching what fish they are after. With this knowledge we can determine where the anglers are to fish by producing the very best type of fishing within each given lake.

In the next chapter I have tried to find the answer to this difficult question.

## Horton Kirby \& Sutton at Hone Angling Census

## Angling Census: Horton Kirby

In order to have some idea what types of anglers use the lakes it was necessary to find something out about what type of angling was being carried out on the individual lakes. This leaves itself open to all sorts of criticism because some anglers simply do not care what they catch. To get around this argument it is important to define what species of fish relate to what type of angler that was using the lake at a particular point in the day.

## Example:

Pleasure Angler: A fisherman using float tackle or quiver (ledgering) tipping fishing for unknown species i.e. tench, bream, roach etc.
Specimen Angler: A fisherman using bite alarms, bait runners usually under a bivvy $99.9 \%$ fishing for carp.
These 2 types of angler were the vast majority, if not the only type of angling going on throughout the year on the club waters. Throughout the summer from June $16^{\text {th }}$ to September $31^{\text {st }}$ for six days per week I counted these types of anglers on each individual lake to try and ascertain what the members wanted to catch from the lakes and also quantify how much angling pressure actually existed, if any.

If is was in any doubt as to what the angler was trying to catch I would ask, but most of the time it was obvious by the tackle and the bait being used: i.e. boilies for carp, corn/ground bait for bream etc. I accept that it is dangerous to pigeon-hole anglers, but in order to find out some information about who uses the lakes for what, it was the most acceptable way of carrying out this task.

Before writing the results it is important to point out that this census was not about finding out the total numbers of anglers in any one day, but to have a single snapshot at any one time.

## Westminster Field Lake

Considering that this lake is the only lake at the Horton Kirby complex where roach are growing to the national growth curve, it was not unexpected to find that the greater number of anglers using this lake were pleasure anglers. Pleasure anglers are using the right type of baits to promote the growth of small silver fish like roach i.e. ground bait, maggots, corn, casters etc. This acts like a supplementary feed going into this fish's diet.

The total percentage of pleasure anglers using this lake this summer was $60.93 \%$, while the number of anglers fishing for carp was 39.06\%

The Westminster Field Lake is mainly used by carp anglers when the Viaduct Lake is not fishing well. The anglers consider this lake to be the easier of the two, mainly because the carp do not grow to such a large size. This helps the angler to believe that the fish are less experienced. It was said to me on many occasions that if the anglers needed to get their confidence back or simply get a bend in the rod, they would prefer to fish this lake, especially if the Viaduct Lake was 'switched off'.

## Viaduct Lake

The total percentage of pleasure anglers using the lake this summer was $23.5 \%$, while the number of carp anglers was $76 \%$.

## West Lake

The total percentage of pleasure anglers using this lake this summer was $70.3 \%$, while the number of anglers fishing for carp was $29.43 \%$.

## Silt Pond

The Silt Pond was used by $100 \%$ pleasure anglers this summer.

## Conclusions

From the above results it is obvious to see that where a particular species of fish exists in high stocking levels it will be the favoured lake for that type of angler. For instance, the bait ban a few years ago restricted the use of boilies on the Westminster Field Lake and some members took it upon themselves to move carp from this lake into the Viaduct Lake. The increase in the numbers of carp in the Viaduct Lake has increased the numbers of carp anglers using it. As with the Silt Pond, where there are few carp to speak of, this type of angling was not observed.

The Westminster Field Lake has a much reduced population of carp, so it is logical to see a reduced number of carp anglers fishing for them and it is the same with the West Lake. This concludes that wherever a species exists in high numbers, the anglers will soon follow.

Because it is a well known fact that the tench population in the Silt Pond is higher than any of the other lakes and they are easier to catch, the greater majority of anglers using this pond were fishing for tench. The bream population in the Westminster Field Lake can be very easy to catch and, as this species dominates the lake's biomass, you will find that most pleasure anglers will target this species.

All of this might sound very obvious from any angler's point of view, but, when it comes to formulating a management strategy, it can be extremely useful to direct what species do best in each of the lakes.

## Angling Pressure

Angling pressure is truly defined by how much pressure the fish are under - i.e. how many anglers are on the bank - not by how much pressure the angler is to get his favourite swim. The vast majority of anglers that fish the two larger lakes at Horton Kirby fish from the centre bank between the lakes to about half way down both sides from this point.

There is no clear reason for this other than having to struggle with all their tackle. Given that this is the case, the rest of the lakes are nearly always empty. At any one time throughout the height of the season, there are at least $50 \%$ of the swims on both lakes free from any anglers. Anglers may complain it is busy, but this is because the swims they want are all near the centre bank.

From an observer's point of view when entering the gates, it is easy to see why some people think there is a lot of angling pressure, but from the fish's point of view, this simply does not exist.

In the winter months the lakes can be empty for weeks on end with only a few regular hardened anglers braving the weather. One thing that was very noticeable was that there were a regular set of faces on the bank each week. It would be difficult to guess, but I estimate as little as 250-400 regular anglers using the lakes throughout the summer weeks, with two distinct shifts. Anglers that fish during the day leave between 4 pm and 6 pm and at the same time, the evening shift is coming on the lakes, most of which do the night and leave the following morning.

The busiest times are from 6 pm Friday through to Sunday morning, when most anglers leave. Sunday afternoons are as empty as the middle of the week. It is true to conclude that if there was any angling pressure on the lakes at Horton Kirby, it would be during these hours and at no other time during the week.

## Angling Census: Sutton at Hone

The Darent Valley has a long history in modern day carp angling and, as such, the complex at Sutton has become the members' carp fishing venue. As with Horton Kirby, the anglers will flock to where they best feel their chances are highest. It is also true to say that at some time in the past the anglers that prefer Sutton have has a bad press.

Where this has come from is not important. What is important is that the club recognises the importance of carp fishermen to its income and its membership. It would have been safe to say that 15-20 years ago, the bivvy/boilie brigade looked like a fad that would pass. Nowadays a single tackle shop and owners of complexes in France can make a lot of money from this sport.

Regardless of one's own personal point of view about carp anglers and whether you think they are all this and that, the sport is here to stay and, as this may be a hard truth for some, the management of our lakes should also recognise that this species is vitally important.

## Sutton Big Lake

This lake is very rarely fished by the pleasure angler. It is a large water with a reasonable head of carp and, because of this, it is represented by a he majority of carp anglers.

The total percentage of carp anglers that fished this lake this summer was $91.32 \%$. This figure does not include Friday evenings, when most anglers will turn up for the weekend, so the true figure will be much greater than this. The total percentage of pleasure anglers fishing this summer was $8.6 \%$

## Sutton Small Lake

Because this lake is somewhat smaller than the large lake, it offers a sporting chance to the pleasure angler to find some fish to catch. However, this lake also has a far greater percentage of carp anglers on its banks than pleasure anglers. The total percentage of carp anglers was $75.22 \%$. The total percentage of pleasure anglers was $24.77 \%$.

## Conclusions

Throughout the summer at Horton I asked the question to carp and pleasure anglers alike "How often do you fish at Sutton?". The carp anglers replied that it's too cliquey and the pleasure anglers said the fishing used to be good once.

After spending the summer walking around Sutton talking to the members and trying to find some truth in this, it turned out to be very true in the case of the pleasure angler and very untrue in the case of the carp angler. But, on the same hand, events in the past of a few over zealous members treating the water like their own back garden has furthered this misconception.

The main reason people prefer to fish at these venues is mainly down to personal choice and nothing more. There are 2 distinct preferences. Some anglers prefer Sutton, others prefer Horton Kirby. The single biggest reason that there are so many carp anglers at Sutton is simply because that is where the greater number of carp and the biggest carp the club has to offer are being caught.

## Angling Pressure

There is a slight increase in angling pressure at Sutton and this varies with the invisible grape vine of what fish are being caught at any one time of the week. This last summer was very poor generally for carp fishing because the lows and highs in the weather systems created barometric pressure changes.

The first week at Sutton was very busy, with up to 70 anglers on the 2 lakes at one time. This number levelled out to a daily average of between 10-15 Monday-Thursday, increasing to $45+$ on Fridays through to Sunday
morning. Again, the most angling pressure was seen from Friday evenings through to Sunday morning, when most anglers departed.

The idea of angling pressure at these lakes is more apparent because there is a greater competition to get the best swims, but again, from the fish's point of view, there is little or no angling pressure.

From a species point of view, carp will tolerate more angling pressure than most specifies, and it is also beneficial to the fish, because they are constantly being fed, promoting good, healthy weights.

With these facts in front of you, it asks the question' "Do we manage our waters for the majority of anglers that fish regularly or do we manage our waters for the total membership, when they may only fish once or twice per season. There is a halfway house, a compromise between both types of angling that should be found. This compromise is also stipulated by what species do best with others!

## More Water

From the club's point of view, the lakes at Horton and Sutton do not suffer from angling pressure. However, because of an uncertain future with water levels, it would be shrewd to search for waters large enough outside the valley so that the club has somewhere to put its stocks in the case of an emergency.

If and when the club buys/leases another water outside the Darent Valley, a contingency plan should be set up for such an event.

## Stocking / Stock Levels

Many anglers think that the answer to not catching fish is simply to buy more fish and put them in the lake. This is a fair and logical conclusion, however it is completely wrong. Stocking should only be carried out when a species of fish has become extinct or its numbers have become so low that it can no longer sustain itself in high enough numbers to warrant fishing for.

In many situations, a great deal of money has been wasted by introducing fish to fisheries where their chances of survival were poor or where there was no need to supplement the natural stock of fish.

Because many anglers visit commercial fisheries where the stocking levels are in excess of 500kg per acre, they expect every fishery to be the same. At stocking levels like this, the fish are under constant stress and prone to high levels of disease. In conjunction with out water level problems, this would be a complete disaster. I cannot stress this enough!

Stocking levels should not exceed 300 kg per acre unless the water is capable of supporting successive spawnings, the end product of having 300 kg of the right sized fish will soon increase to $500+\mathrm{kg}$ of mixed size fish. Because the water may not be able to sustain 500 kg of fish, the larger fish that anglers want will soon be competing with their own offspring for food and space and the eventual outcome is stock consisting of old adults and millions of small fish.

These small fish become sexually mature when they are undersized and the population becomes stunted. This is why it is important to have some policy of regular netting to crop off successive generations. This in fact leads to what could be described as self-sustainable fishery.

The fish which are cropped off can be sold or used to restock other waters. This is why it is usually unnecessary to buy in stock. The next big question is what stock do we want in our waters and how to achieve it. The answer to what stock do want is dictated by what the active membership want to catch and what species coexist happily with others.

## General Purpose Fisheries

Because some species of fish compete with others for food and space, the species most able to adapt to a particular habitat or food will nearly always increase in number. A classic example of this is with the bream population in our waters. The bream was originally a riverine species found in large, slow flowing rivers in a zone called the bream zone.

Given that they do very well in this environment, it was logical to conclude that this species would be very popular in still waters with plenty of space to grow and reproduce. However, it was unforeseen that the modern day carp angler would be using high protein baits fished on the bottom.

In effect, what has happened is the bream populations have been artificially sustained by these baits, making them the dominant species in all our waters. Because they are being fed continuously throughout the year, their numbers are increasing and they are in excellent spawning condition each spring.

The knock-on effect of having a large biomass of bream is detrimental to every species of fish other than the predators. The large numbers of bream feeding on the bottom will also increase the amount of suspended solids in the water column. This increases the turbidity, reducing light, thus reducing weed growth, thus reducing available food for other species.

The scale counts from the bream at Horton Kirby show that the species is growing well above the national growth curve, basically because this species has adapted to feeding on carp bait put into the waters by the anglers.

The long term effect that the bream will have is that the species like roach and rudd that rely more on invert food produced by submerged weed (Benfic feeders) will have a much reduced weight. This lack of weed growth is caused by the suspended solids created by bream.

Although the tench will be able to feed on the carp baits, any first year fish the tench produce will not be able to
compete with such large numbers of bream. Subsequently stocked small tench (less than 11b) will also die of starvation. The population of tench in our waters will hang on, but not to any stock levels that anglers want.

The carp in our waters have reduced weight for two reasons:

1) The depth of the water in the lakes is too deep for optimum growth rates.
2) Competition from bream when feeding

Because roach, rudd and bream spawn before carp on our waters, the available food items that are the correct size for first year carp are not available; they have all been eaten by the first year and adult silver fish which spawned earlier. Taken that there is no carp recruitment, due to competition and the lack of available habitat, the carp numbers will slowly be dropping due to natural mortality and the great age of our fish. The eventual outcome of the present situation is a lake full of small, stunted roach and rudd, a few large tench and some very old carp, along with hundreds of pounds of juvenile and adult bream.

Because the bream is not naturally indigenous to still water gravel pits, it is overlapping with other bottom feeding species such as carp and tench. Large and small tench do reasonably well in a well weeded water with large carp, but tench do not do well when competing with large numbers of small carp. This has been proven under lab conditions.

In fact, Coombe Bank was once a prolific tench water until it was stocked with small carp. It is not difficult to see what happened after 10 years.

Sustaining a mixed course fishery is very difficult and more expensive because species compete and constantly battle for the niche in the environment. However, since fishery management has come a long way in the last 10 years, it is possible now to overcome this problem.

## Species Specific Lakes

Once a species of fish like the bream has populated a water like the lakes at Horton Kirby and at Sutton, it is impossible to completely remove them without draining down the lake. As this is out of the question due to no guarantee of having enough water to fill them up and the fact they are popular with matches, it is only ever likely that their numbers can be reduced by successive netting.

There is a strange irony in that the two main protagonists within the committee room are represented by the two species of fish that compete most within the lakes.

A species specific lake does not mean a lake with a single species of fish in it. Having a lake with a single species of fish in it does not completely cut out the need for regular cropping because eventually the offspring will compete with the adults. What a species specific lake means is having a lake whereby the competition is reduced to such an extent that the fish remaining grow and recruit without detriment to each other. In other words, they fill a separate feeding niche.

## Example:

Originally the Silt Pond was stocked with tench, roach, rudd, crucian carp and perch. This mix of species is not ideal because rudd will not compete well with roach. The roach is able to feed anywhere within the water column, so it will compete at the surface and mid water with the rudd. If you take the roach out of the equation, the rest of the species do very well together.

The tench, which predominantly feeds on the bottom and sometimes mid water, will not compete with a surface feeder like the rudd. Each year the tench will spawn in this lake, as they were observed this summer, but the ova and fry are food for the roach and perch that spawned earlier.

The perch will also do well because it will feed on successive generations of young rudd. When the Silt Pond was first dug, tench showed that they were recruiting good numbers but, because the small roach and rudd were not cropped off regularly, the first year tench could no longer compete with such large numbers of fish.

The crucian carp were successively eaten by the pike which lived in the Willow Carr before the lake was dug. Any adults that remained and spawned would face stiff competition from the increasing numbers of small silver fish. Any bait the angler puts into the water would not reach the bottom and they simply starve to death.

The end equation is that if want a good environment for a particular species, then reduce as much of the competition as possible. Hand in hand with this goes the correct habitat management by supplying spawning areas i.e. weed beds $=$ food $=$ nursery areas.

## Numbers of Fish

From the netting carried out at Horton Kirby and viewing the video of this process, it was easy to see that there are enough fish in the lakes, but the vast majority of them are too small. The simple reason for this is there is only a certain amount of food to go around.

Food items are either naturally produced by plant life or introduced by the angler's hand. If there are 10 fish in a tank of the same species and you feed the fish with 10 grams of food per day, each fish should get 1 gram each. If you remove half the fish and feed the same amount, then the fish remaining should get 2 grams each. Obviously, if giving one fish 10 grams of food each day, the single fish will produce ten times the weight.

This may sound obvious but, in effect, that is exactly what is happening in the lakes. By removing a percentage of your stock, it allows the remainder to grow and create a healthier stock.

If we assume the netting was only $50 \%$ successful then there was $50 \%$ of the fish still remaining in the lake. When it comes to netting a lake, it can sometimes feel that you are removing all the fish, but this is not the case. If the club was to then go out and buy some more fish of a similar size to replace the ones taken out, it would only be replacing the problem we had in the first place.

It is possible to buy in larger fish, but the chances of introducing unwanted pathogens into the water are high, especially if these fish are small carp. A recent study carried out by the EA said that $61 \%$ of waters suffering from disease problems had a recent stocking of small carp. All of these fisheries were $100 \%$ managed.

This is why self sufficient waters take time and patience. An increase in the weights of the fish will happen. If fact, it happens quickly because parts of the fish which take the longest to grow - i.e. eye lenses, bone structure - are already mature in a stunted fish, so the growth can really happen quickly, but from out point of view a couple of years is optimistic. This growth is also dependent on how many anglers are using bait. Supplementary food can be introduced during the winter to improve growth rates. This can be in the form of pellets.

## Predator / Prey Balance

The EA and Thames Water carried out electro-fishing surveys of the margins the last 5 and 20 years. Whet they thought the found was an over-population in small pike. In conjunction with this, they found small numbers of roach, bream, perch and occasional tench. What is surprising is that they concluded from this that there was an imbalance between predator and prey species.

The single most likely place you would find jack pike is in the margins, while larger numbers of other fish, such as bream and larger roach, you would find in deeper water where electro fishing is less effective. From this advice, the club introduced a pike cull of fish up to 7 lbs . What, in effect, happened was that anglers were removing any pike on all the waters that they caught and fish up to 15 lb were regularly found in the skip and bushes.

This cull has had a major effect of the natural balance within the system and only gone to make the problem of a stunted population worse. The reports also said that the pike were very slow growing. This is mainly down to the fish having to chase and feed on small fish, rather than eating a good-sized meal and laying up, putting weight on. This cull created a vicious circle.

The major difference between fisheries without pike, such as any commercial fishery, is that they regularly crop by draining, whereas we cannot do this. So we need to maintain a natural balance between these species. The recognised balance is 1 pike to every $8-10$ prey fish.

At the present, it is more likely to be 1 pike to every 5000 prey fish. Once we have cropped off a large number of these prey fish to allow for extra growth, the remaining fish then become the prey items for the pike.

Alternatively, it would be necessary to re-adjust this balance by introducing some large females.

## Fertile?

It has been mentioned many times to me since taking up this position that the lakes at Horton and Sutton are infertile. If this was the case, then the lakes would not be able to produce such huge numbers of small bream and roach. However, a lake once filled with water is slowly using up its available nutrients.

When this occurs there is a state of equilibrium and any amount of nutrients produced by plant life etc. will be finite. In effect, the nutrients needed to sustain more life inverts and fish will remain locked in the lake's bottom.

On fish farms that produce cyprinid fish, they will dry out the pond beds until they freeze and crack. This process unlocks the nutrients needed to produce more plant life and inverts for fish. To enhance this process, they will use a natural fertiliser such as cow or horse manure.

The best thing for some of our smaller waters would be to pump them out and start again. When the Westminster Field Lake dried out, the following spring, they were prolific numbers of small carp. It was by sheer accident that the drying out process has repeated what carp farmers do all over the continent every year. Another reason why the roach are growing to the national growth curve is because the margins dry out every year, releasing nutrients into the lakes' ecosystem: a 'double-edged knife'.

Drying out and fertilising some of our small waters will improve their holding capacity and improve the life span to produce better quality fish for another 5-10 years.

## Conclusion

The club can, in effect, have any species it wants in any size it wants but, in order to achieve this, it needs to set up a netting management plan whereby one of the lakes is cropped every year. The species that cannot coexist with others without competing must be removed or reduced to allow the favoured species to recruit and grow. Eventually, when this species has reproduced and starts competing with its own offspring, the club will be able to produce its own fish, making a profit from its stock or re-stocking other waters, such as Brooklands.

## Habitat Management

## Habitat Improvements

Habitat improvements go hand in hand with the selective removal of fish. The general habitat available for food production and spawning areas in most of the lakes is very poor. The main reasons for this are that the lakes themselves are old and the available nutrients needed for plant growth are locked within the bottom of the lake.

A fine example of this is when the Silt Pond was first dug and the anglers had to make an opening in the weed growth to fish. This period of high fertility within the nitrogen cycle only lasts for a finite amount of time. During the first 15 years after filling up with water is the most productive part of an lake's life.

Because submerged weed growth relies on light reaching the nutrients at the bottom of the lake, it is inhibited by the large numbers of bottom feeding fish. These fish, which stir up the bottom, create high levels of turbidity, reducing the available light reaching the bottom.

For example, if you were to remove every bottom feeding fish then, like a trout fishery, the lake would be gin clear within a season and the weed growth would return. Weed growth produces food items for fish. Too many bottom feeding fish and the chances of creating algal blooms increases. These blooms are created because the nutrients stirred up by the fish act as food for single-celled algae Billions of these plants together create the green soup effect. Although this is rare, it does happen during long, hot summers.

The main reason for the lack of marginal growth is down to two factors:

1) The deep shelving banks, especially found on the large lake at Sutton.
2) The lack of past management of over-hanging trees i.e. crack willows.

Without these shallow areas of water which warm quickly in the spring and the lack of marginal plant growth, species such as carp have limited areas to spawn. In turn, when the fish do spawn, the first year fish have no feeding areas or shelter from predators.

This lack of available weed growth both submerged and marginal plants has a direct effect on how many fish the lake can support. The theory in nature called the pyramid of life stipulates that a lake needs to produce a 1000 tons of weed to produce 500 tons of inverts to produce 250 tons of fish growth.

Many of the species of fish therefore rely solely on what bait is introduced into the water by the anglers. Lakes such as the Viaduct Lake, which is predominantly fished by carp anglers using large baits like boilies, are only feeding the species of fish which can adapt themselves to this type of food i.e. bream and carp. Because there are more bream to carp in this water, this creates the imbalance of species.

To avoid this problem it is necessary to separate these species as much as possible to reduce competition between them. The carp put more weight on and their offspring are predated on less. The bream do not then throw the balance out within the lake, helping other species, such as tench, roach and rudd, to grow on.

So the habitat management of the waters is relatively easy. The overhanging trees need to be managed so that only $10 \%$ of them are hanging over the water. Shallow areas need to be created and planted with marginal plants. The numbers of bream need reducing to enhance submerged weed growth and address the balance within the biomass.

This management of the lakes needs to be addressed seriously by the club and funds spent to improve the overall food chain within the lakes. Rather than having bare banks and areas planted up that dry out during the summer, we need areas that are more likely to remain under water during the driest parts of the summer.

Once these areas have been created, they need yearly management to reduce the increased growth of the overhanging trees. They simply cannot be left to get on with it, because the trees shade out the marginal plants and we are back to square one.

The overall picture of the lakes would massively be improved, also giving the anglers more places to feel alone and creating natural holding areas for them to fish.

## Water Control

There is a distinct lack of water control of the lakes at the present time. What I mean by water control is the physical management, allowing us to control how much we actually lose. On the large lake at Sutton, the present control is an old baking tray placed across the pipe outlet. At this outflow there should be a new dam and pen stock built so that we can control the water levels, rather than them flowing through the bank eroding this area. Eventually, this bank will become unstable and the top 3.5 ft will flow out into the field.

The pipe between the West Lake and the Viaduct Lake should be removed because most of the water filling the Viaduct Lake passes through the porous bank along the centre path. If and when the water level falls in the Westminster Field Lake, the centre bank could be puddled with clay to help maintain the water levels in this lake.

It is important that the management of the lakes, including stocks of fish and marginal plants etc. are managed for the worst years of our worse case scenario, rather than managing them for the best years! There is no guarantee that the next phase of the Darent Plan will happen and it would be foolhardy for us to sit on our laurels expecting a government organisation to solve our problems for us.

## The West Lake

We have a major problem. How do we produce young carp without stocking and running the risk of introducing disease?

The West Lake could be used for producing our own fish by creating a mini carp fishery. The best advantages to this is the low cost and minimal maintenance. The lake could be drained with 2 large pumps either bought by the club or hired. Once the water levels were sufficiently low enough, the fish could be moved or sold

## Example

1) The tench could be removed and introduced into the Silt Pond to increase the adult population, hopefully improving the recruitment there.
2) The pike (if any) can be moved to the 2 larger lakes, going some way into redressing the balance lost there.
3) The carp (approx $50-60$ fish) could be introduced into the Westminster Field Lake, replacing the lost stock which were removed during the bait restriction.
4) The silver fish (i.e. rudd, roach, bream) could be transported to Brooklands or sold to the netting team.
5) Any large perch could be introduced into the Silt Pond or the 2 larger lakes.

Once the fish have been removes, the lake should be left to dry out for at least 4 weeks until frost and ice has cracked the bed of the lake. During this month, any work needed to be carried out could be. During the last month, I have dug 2 test pits, one of which was lined with clay, the other left empty (it was lined from the spoil near the toilets).

The clay was puddled using a hammer against the sides and left to naturally fill with rain water. The clay lined pit has remained full of water since filling up. The non-puddled pit has never held any water at all. Alternatively, the club could send a sample of this clay to be tested for clay content to make sure that it has the right clay content.

If the mix was high enough for puddling, the next job would be to hire in a JCB with an experienced driver and start to puddle this lake. When the puddling was finished, the lake could be manured with 1 ton of horse or cow manure, filled with water and left until the spring (May).

Dependent on the lease agreement at Coombe Bank, we could remove 50 kg of small carp (Linear and Common) from the dam end end of the lake and introduce them into a highly fertile water. The pipe that leads to the viaduct should be taken out or blocked up to reduce any risk of water borne disease. At the same time, we could introduce small rudd to the lake. Because this species does not compete with carp, they would be an extra species to enjoy by the members.

Once the season opened we would have a Coombe Bank-type fishery at Horton Kirby and, while the anglers are fishing, they are also feeding the fish for us. During the following close season we can supplement their diet by feeding pellet and, after 2-3 years we can grade the larger fish out into the other lakes.

The remaining stocks would then improve their weights due to having more room. A section 30 would be needed to move fish from Coombe Bank or to Brooklands.

## Conclusion

By producing small carp and introducing them into our other lakes, we are improving our future brood stock. Many of the fish at Sutton are old fish, being 22 years old. These large fish need longer and longer periods of hot weather to become sexually mature and the topography of these gravel pits is not ideal for large carp to spawn. They are simply past their sell by date.

If the lease does not allow us to remove the fish, we can introduce some of the younger fish from the Westminster Field Lake and leave them to reproduce naturally, although this method will take much longer to produce any decent fish. The problem of introducing fish into the West Lake is not a high risk because the water only leaves by one entrance, which is into the fields.

The fish at Coombe Bank have already been health tested by MAFF, so the chance of introducing a disease into our other lakes is minimal. As long as the levels of stock are not too high, fish are less susceptible to disease. The stocking levels at Coombe Bank are ridiculous, so it is likely that, if a disease already existed, it would have shown up by now and wiped out that population.

## Golf Course

At Mid-Kent fisheries they have overcome this problem by putting some of their brood stock (10-15lb males and females) into the ponds on local golf courses.

Here the adults spawn and are then removed and the remaining offspring left for three years to grow on. The manager has informed me that they have produced in excess of 800lbs of small carp like this without any maintenance at all. The added security of this method has its advantages over earth ponds on our own sites and the reduced man hours in husbandry.

## The Silt Pond

The silt pond is the club's best tench water and it should be promoted as this. All the anglers that I spoke to this summer and last winter fished on this water with this species in mind and some anglers fish nowhere else, such is the pull of this fish.

This species of fish is a poor competitor with nearly all other species of fish and requires low stocking densities of all other species, particularly species that compete with its young. Because this fish is slow growing and requires a well weeded water, it is necessary crop off the other non-target species regularly to allow the young to get through to the food.

The other 2 species most sought after on this water are large rudd and crucian carp. Because rudd hold a separate feeding niche within the pond, they do not compete with the tench. However, as mentioned earlier, they do not compete well with roach and large numbers of their own offspring.

Crucian carp are at the top of the menu with pike because they are perfect size and shape for young jacks. Young pike will specifically target crucian carp because they are easy to catch. As a species they are also poor competitors, needing distinct types of environment, many of these factors are unknown. These carp either do very well in a water or often disappear completely.

A better alternative is they brown goldfish. They compete much better than crucian carp and are not so fussy about their environment. However, there are the puritan anglers that prefer to catch crucian carp if they can tell the difference.

The perch population is doing very well in the Silt Pond, although they passed through the nets during the survey, they show regularly in the anglers' catches. This species could do with cropping off to allow for promoted growth of the fish left. A finer mesh will have to be used for the next time they net so we can pick up the first year fish as well.

## The Plan

At the present moment, there are huge numbers of fry or small roach, rudd, bream and perch in the Silt Pond and these fish will need cropping off to allow the tench recruitment and the remaining rudd to grow on. The committee could set up 2 pike matches this winter or early next year to remove the offending crucian killers. These fish could be removed to the Westminster Field Lake.

There is no need to invest in buying more tench because the adults from the West Lake could be transported into this lake. However, the club might like to invest in a mix of crucian carp and brown goldfish to improve the stocks of this fish. If these fish do not show in the catches in the following 3 summers, then there will be no nee to restock with them as the conditions in this pond do not suit the species.

## Conclusion

The pond needs cropping of small rudd (less than 7 inches), as many roach as possible (all sizes except 1lb+), small perch (all fish under 8 inches) and any bream or eels present, a complete pike removal and re-stocking with crucian carp and brown goldfish. Any of the large carp can also be removed if caught and replaced in the Westminster Field Lake.

All the species which are removed can either be sold to the netting team to par or partly pay for the work or these fish could be removed and stocked into Brooklands. Without a serious cropping of many of the small fish in this pond, the tench will soon disappear because there no young tench coming through the ranks. This species lives to about 10-14 years of age. Similarly with the large rudd, the competition between themselves and their offspring will soon reduce the numbers of the large fish. This has already become apparent in the reduced catch rates.

The crucian carp are hanging on in very small numbers, being recorded in catches once or twice a year. These fish are often quite large and there is no evidence of recruitment.

## The Future

Below are some important issues that need to be discussed at committee level before managing the 4 larger lakes:

- Most importantly, what species cohabit best together?
- Who actively fishes the lakes and what do they expect from their fishing in the nineties?
- How easy is it to remove the species that are already established?
- It is well recognised that carp and tench are difficult to net out of a water and the only true way of removing these fish is by draining. These facts alone are extremely important when deciding what to do.
- Bream and carp are the two single species that should never be be stocked together!
- The reduction of bream will have a marked effect on all other species within the lake.
- Carp recruitment and their weights will improve without competition from other species
- Restocking with any species without first addressing the balance is a waste of money.
- Do we sell the fish to the netting team to pay or partly pay for the job, or do we transport them to restock Brooklands?

With these facts and ideas in this report on the lakes, it would be wise for the committee to digest and mull over exactly what is to be achieved in the years ahead and a compromise found, never forgetting that its the fish that do not get on well. I have ideas of my own, but it would be unfair on me and wrong of the club to expect me to put my head on the block at this early stage.

Therefore, I would like the committee to allow me to prove to them that the ideas on the Silt Pond and the West Lake are beneficial to the club's members and then to move on to the more politically sensitive waters at a later date.

If you have any questions about this report or wish me to clarify anything, please feel free to grill me at your leisure.

Robin Moore FMD

## References

Freshwater Fishery Management
Freshwater Fish / British Isles
Wildlife After Gravel
The New Rivers Handbook
Textbook of Fish Culture
Thames Water 1979 DDAPS Report

Templeton / second edition
Giles Nick
Giles Nick
RSPB
Huet
I.M. Griffiths

# Fisheries Survey of D.D.A.P.S. Lakes 

## At Sutton-At-Hone Sept/Oct 1979

M.P.C. Fisheries \& I.M. Griffiths<br>Thames Water - Directorate of Scientific Services<br>December 1979<br>Metropolitan Pollution Control, Rivers House, Crossness Sewage Treatment Works, Abbey Wood, London, SE2 9AQ

## 1. Introduction

The Metropolitan Pollution Control Fisheries Section undertook this survey in response to a request from the Dartford and District Angling \& Preservation Society (DDAPS) and in fulfilment of the Metropolitan Pollution Control Fisheries Management Plan for the Darent Valley.

The lakes at Sutton at hone are managed and fished exclusively by DDAPS members. The club employ a team of professional bailiffs who maintain the lake and surroundings to a very high standard.

The lakes have established a reputation as a first class fishery, particularly as specialist carp and tench waters. However during the past few years it would seem that the fishery has deteriorated. Catches are lower and the numbers of 'specimen' fish caught have fallen off.

The aim of this survey was to assess the present status of the fish populations in the two lakes and to provide a scientific basis for subsequent improvement and management of the fishery.

## 2. Topography

The Sutton at Hone fishery consist of two lakes lying alongside the River Darent. Both lakes were originally gravel workings, but gravel digging ceased many years ago and with careful landscaping and management by the club the waters have matured into attractive lakes.

The small lake is approximately 1.75 hectares. It is roughly rectangular in shape and has a 'banjo' shaped extension on its western side. It is generally steep sided and 3-4 meters deep at the deepest points. From photographs taken during a recent drought, the bottom is irregular, with deep furrows and troughs left from the gravel excavations. The average depth of the lake is 2.5-3 metres. The 'banjo' area of the lake, separated by a narrow channel, is somewhat shallower, being 1-1.5 metres. There is no inflow or outflow to the lake.

The large lake is separated from the small lake by a wide centre path lined with willow trees. The lake has an area of approximately 5 hectares and has several small islands. A number of shallow reefs have been left during excavation which are exposed during periods of low rainfall. With the exception of these small islands and reefs, the lake is not dissimilar to the small lake.

Normally there is no inflow or outflow from the large lake, but a small penstock in the south east corner allows water into the lake from the River Darent, when the river is high.

Both lakes are connected with the groundwater and, in 1976, the water level fell considerably and the small lake completely dried out.

## 3. Biological Survey

A brief biological survey was undertaken by Fisheries Staff on $10^{\text {th }}$ October 1979. Invertebrate samples were taken at a number of points along the shoreline and in the macrophyte stands using a standard 'kick sample' method. The animals were identified in the Metropolitan Pollution Control laboratories and are presented in Appendix 1. The aquatic macrophytes were also identified and are included on this list. This list provides only a guide to the variety of species present and must not be regarded as a complete list.

The species lists compiled from each lake were very similar and there appears to be no significance difference in the flora and fauna. Therefore the species lists have been combined in Appendix 1.

A total of 18 invertebrate species were identified. The species composition is indicative of a well balanced ecosystem and it to be expected in lakes of this type. The distribution of the invertebrates tended to be limited to the few macrophyte stands and to a narrow peripheral band on the steeply shelving banks. The aquatic macrophytes were sparsely distributed with the exception of a narrow band of reeds on the north west margin of the small lake.

## 4. Chemical Survey

Samples of water were taken on $17^{\text {th }}$ October 1979 and analysed at the Crossness Laboratory for unionised ammonia, ammoniacal nitrogen and pH . Temperature and dissolved oxygen were measured at the site using a dissolved oxygen meter. No other parameters were tested because there was no reason to expect any deleterious chemicals to be present and regular sampling of the adjacent River Darent consistently produces water of grade 1A classification Ammonia can occasionally cause problems in lakes of this type, but the analysis detected minimal background levels. The results are tabulated below:

## Chemical Data

|  | Temp. | \% Dis. O2 | pH | Ammoniacal Nitrogen (ppm) | Unionised Ammonia |
| :--- | :--- | :--- | :--- | :--- | :--- |
| Small Lake | 16 | $80-100$ | 7.9 | 0.02 | Nil |
| Large Lake | 16 | $80-100$ | 7.7 | 0.01 | Nil |

There is no significant difference between the water samples taken from each lake.

## 5. Fisheries Survey - Methods Adopted

The fish population was sampled on $25^{\text {th }}$ September 1979 using seine nets and gill nets.
The lakes were too large to be netted in one sweep. Therefore 40 metre 'sand eel' seine and 70 metre 'cod end' seine nets were used to make several sweeps in corners of the lake. In this way about 4000 small fish were caught.

In order to supplement this data it was necessary to set gill nets with large meshes. In this way it was possible to catch fish of sizes not caught in the seine nets. These nets were checked at intervals throughout the day. Only one pike was caught and released undamaged and the nets were left in position overnight. A further five pike were removed first thing on the following morning.

A number of large tench and carp were caught by electro fishing around the margins of the small lake on the $26^{\text {th }}$ September 1979 using a pulsed direct current machine.

A further seine netting was carried out on $19^{\text {th }}$ October 1979 to complete the date for the bream population analysis (insufficient numbers of certain year class were caught on $25^{\text {th }}$ September 1979).

Samples of fish were weighed, measured and scale samples collected. All of the fish were quickly returned to the water with the exception of a mall number, which were taken to the laboratory at Crossness for detailed health examination.

Analysis of the growth and population data suggests that the fish populations in each lake are extremely similar.
There is no significant difference between the age/length data for the bream and roach from each lake and, for ease of interpretation, the data has been combined and is displayed in graphs 1 and 2.

## 6. Health Check

The fish at Sutton-at-Hone host several species of crustacean, helminth and worm parasites. Almost all of the roach and bream carry low levels of the common eye flukes Diplostomum sp. And Tylodelphys sp. Approximately $15 \%$ of the population of small fish carry the abdominal tapeworm Ligula sp. The gill fluke Dactylogyrus sp. was noted in low numbers on the gills of one roach. Approximately $50 \%$ of the roach and bream and one tench carried the gill louse Ergasilus briani. The small perch carried the pike worm Triaenophorus sp. in the liver. The fish louse Argulus was noted in low numbers on many of the fish.

In general these parasites were not at high enough levels to cause extreme disability and are unlikely to cause mortalities or growth retardation at their present levels. Fish infected with Ligula often show reduced growth rates and are unable to breed.

The incidence of the crustacean Ergasilus is of concern as under favourable conditions this parasite can cause considerable mortalities, especially amongst tench. Transfer of fish from these lakes would not be recommended and not permitted to waters not already affected by Ergasilus.

## 7. Discussion

The two lakes at Sutton at Hone are extremely similar in terms of water quality, biology, fish growth and population size. The water quality is first class. The biological survey indicates that there is sufficient diversity of food organisms for the fish. However, the overall productivity of the lakes seems to be low and limited to the periphery of the lakes. (This is a problem common to many man made lakes). The lake bottom shelves very steeply and the water is too deep and coloured to allow sufficient weed growth and associated fish food productivity. In some parts, especially the large lake, this zone is further limited by overhanging trees shading the water and inhibiting weed growth.

The fish populations tend to be reliant upon this narrow band of food and cover. In this region there will be considerable competition for food and space which may be a major factor affecting the growth rates of these fish in such a large water body.

Methods of increasing this productive zone by encouraging weed growth in several areas of the lake may be very beneficial to the fish populations. The creation of a few shallow bays or reefs could be considered. This will also provide increased spawning areas and improve the recruitment of young fish to the population.

## Roach and Bream

Roach and bream are the dominant fish species in the lake. The growth rates of these fish have been summarised in the age/length graphs - see graphs 1 and 2.

The growth of the roach is compared with Ryemeads Lagoons (an extremely fast growing population), Bexley Gravel Pit (an example of a slow growing population) and a standard, medium growth curve compiled from a considerable amount of data from the South of England (Hickley and Dexter 1979).

This shows for the six years the growth of the roach is fairly slow. Few fish older than six years were caught. The growth of these fish was only slightly improved.

The growth of the bream is shown in a similar manner and is compared with a relatively fast growing population from Wraysbury Gravel Pit and a standard medium growth curse (Hickley \& Dexter 1979). Once again, the growth rates are relatively slow for the first 7 years. Few fish older than 7 years were caught apart from one large fish of approximately 2 kg which could not be accurately aged.

The reasons for the slow growth of the roach and bream is not at all obvious. However the evidence gathered during the survey suggests that the following factors are of importance:

- An overall shortage of food and overcrowding in the peripheral area of the lake, especially affecting the larger roach and bream, which are more dependent upon vegetable food material and macro invertebrates.
- Possible over-population with small fish (N.B. It is difficult to assess the size of the population).
- There may be selective predation of the larger fish by pike just as the fish reach a reasonable size.


## Perch

A fairly large number of 1, 2 and 3 year old perch were caught and hopefully this species will re-establish itself in the lake. It is likely that the perch population declined in the past due to the perch ulcer disease which decimated populations in the South of England.

## Carp and Tench

The carp and tench caught appear to be in excellent condition, although insufficient fish were caught to construct a detailed growth curve. Details of the fish caught are shown in tables 1 and 2.

The carp are extremely difficult to age, but most appeared to be between 10 and 12 years old. This represents a
moderate growth rate. No young carp were caught, indicating that they have not successfully bred in recent years. This is not unusual in lakes of this type, but restocking with younger fish should be considered.

The tench are also difficult to age, but all of the fish caught were more than five years old and some were greater than ten years. No younger fish were caught, suggesting that there has been little recruitment in the lake in the past few years. Stocking with young fish should be considered.

## Pike

The pike population in the small lake appears to be fairly large, with many fish between $1-2 \mathrm{~kg}$ present. The growth rates of these fish are extremely slow and most of the pike caught were between 9 and 10 years old - see table 3.

The reasons for this slow rate of growth are not immediately obvious, but it would appear that there are too many individual pike of around the same moderate size in what are relatively small water bodies. This has led to increased competition for the available food and the available cover, both of which appear to be very limited in any case.

Pike of this size prefer to prey upon fish larger than 20 cm and there are not many of this size in the lakes. Whilst they will capture and eat smaller fish, it has been suggested that they burn up too much energy in catching sufficient numbers of small fish, leaving no surplus energy available for growth.

## 8. Conclusion

The survey indicates that both lakes provide similar habitats for the fish and show comparable fish populations and growth rates. The water quality is first class. The food organisms for the fish are diverse and well balanced, but their productivity seems to be restricted by the steeply shelving sides of the lake and the lack of weed cover.

The roach and bream show slow growth rates which are most likely to be related to the low overall productivity of the lake.

The pike population appears to be fairly large, especially in the small lake, and consists mostly of extremely slow growing fish between 1 and 2 kg .

The carp and tench populations are very unbalanced and show a preponderance of larger, older fish. Little or no breeding has taken place in recent years.

The fish carry a diverse parasite load which is unlikely, except in certain individuals, to be responsible for significant growth retardation or mortalities. The presence of the gill louse Ergasilus is of concern and transference of fish from these waters to unaffected waters would not be permitted.

## 9. Management Recommendations

There is considerable scope to improve the fish populations within these lakes. There appears to be two options open to the club. In our opinion the most favoured option is to utilise the small lake a first class specimen fishery and maintain the large lake as a more general fishery. The other alternative would be to treat both lakes similarly as general fisheries and take steps to improve productivity.

The small lake is better suited for development as a specimen water because its limited area and more open aspect will enable any management effort to have a greater impact on the water body.

## Option 1 - Small Lake

a) Increase productivity and cover by creating larger weed beds in selected areas of the lake and by protecting existing weeds from the abundant waterfowl on the lakes. It may well be necessary to create shallow bays and reefs in order to effect any substantial increase in productivity.
b) Heavily destock small roach and bream and remove as many pike as possible - this may have to be done on a bi-annual basis.
c) Restock with a young carp and tench to balance the populations of these fish. If natural recruitment is poor in future years it may be wise to introduce a small number of one or two year old fish each year.
d) Restock with a number of large roach, perch and possibly rudd in order to accelerate the establishment of the fishery.
e) Monitor the progress of the fishery with the aid of future surveys and by keeping accurate catch statistics.

## Large Lake

a) Increase productivity by planting and protecting weeds, especially around the islands and reefs. Removal of some of the trees around the lake would also help by allowing more natural light to penetrate into the water and this would stimulate the growth of water plants (including algae).
b) Restock the lake wit the surplus fish culled from the small lake.
c) Restock on a regular bases with small numbers of young carp and tench in order to compensate for the apparently poor natural recruitment.

## Option 2

The second option is to treat both lakes in the same way.
a) Increase productivity by creating more shallow areas and more weed beds.
b) Destock the roach, bream and pike on a regular bi-annual or tri-annual basis.
c) Restock with young carp and tench as aforementioned.

## Appendix 1

Species List - Sutton At Hone Lakes

## Invertebrates: 18 Species

| Crustacea | Asellus Aquaticus <br> Gammarus sp |
| :--- | :--- |
| Hirudinea | Helobdella stagnalis <br> Piscicola geometra <br> Hemiclepsis marginata |
| Hydracarina | 1 species |
| Hemiptera | Corixa falleni <br> Sigara distincta |
| Mollusca | Bithynia tentaculata <br> Physa fontinalis <br> Planorbis sp |
| Platyhelminthes | Dugesia polychroa |
| Chirominae | 2 species |
| Nevroptera | Sialis lutaria |
| Odonata | Pyrrhosoma nymphula |
| Trichoptera | Phryganea sp <br> Philopotamis sp |
| Aquatic macrophytes | Ceratophyllum demersum <br> Myriophyllum spicatum <br> Potomogeton crispus <br> Typha sp |
|  | Nupha sp <br> Mentha aquatica |



GRAPH 2. GROWTH OF BREAM FROM SUTTON AT HONE COMPARED WTTH:-
a) Wraysbury 17 Gravel Pit. (Gge 1978)
b) STANDARD MEDIAN GROWTH CURVE (HickLEY - DEXTER 197व)


NB. IT IS ASSUMED THAT THE SUTTON AT HONE BREAM IAAVE, AT THE TIME OF SAMPLING, REACHED THE SIZE OF THEIR NEXT BIRTHDAY.

## Management Proposal 2016

## Habitat management

Habitat management is of the utmost importance and as per the 1998 plan page 18 we need to push forward with the removal of many of the crack willows and the management of those that remain. a program of marginal planting will be implemented along with the construction of fish refuges on all venues. It will also be important to look at various methods of controlling the Zebra mussels that are now present in Sutton At Hone and Horton Kirby. We believe that most of the fish required for stocking can be reared in house keeping costs to a minimum.

## Stocking of venues

## Horton Kirby

## Silt Pond

We see this lake as a carp and bream free water stocked with Roach, Rudd, Crucian Carp, Tench and Perch with regular cropping of the smaller silvers all of these fish should reach specimen size.

## West Lake

Kept much the same as it is with a large head of small carp and skimmers etc this lake will then act as a growing on pond for the Viaduct and Westminster field Lake.

## Viaduct

A major destocking of small roach and skimmers to 1 lb these fish will either be restocked into Brooklands or sold on. we would then restock with approx 450 carp from the west lake. The west lake would then be stocked with around 2-3000 C2 carp.

## Westminster Field Lake

Cropping of small roach bream underllb to Brooklands or sold on, skimmers and bream that remain to be stocked into the viaduct lake. Obviously it will be impossible to remove all of the bream from this lake as even if we are really successful with the netting we will still only manage to catch around $60 \%$ of the fish. These fish will remain in the Westminster field lake to be grown on for future stockings of the Viaduct Lake it is not thought that any further fish are required for this lake apart from tench.

We believe that this will create a specimen lake not only for carp and roach but also tench. Perch and Pike This will also create a runs and match style water in the viaduct lake.

## Sutton At Hone

The plan will also be rolled out at Sutton with the Banjo remaining much as it is i.e. a growing on pond for the rest of the venue.

## Car Park Lake

Being the specimen lake the small roach and skimmers up to 11 b would be removed to Brooklands or sold on. The larger bream would then be stocked into the big lake, and as in the Westminster field lake the only stock required would be 200-250 tench.

## Big Lake

Cropping of small roach and bream up to 1lb to Brooklands or sold on. we would have by this time grown on via the banjo and stock ponds and poly tunnels around 500 carp which will be stocked into the Big Lake, plus the bream over 11 b from the car park Lake. We will also stock the big lake with large bream from Devon Rd. Restoration of the river at the back of the Big Lake will be carried out with tree removal and de-silting to encourage weed growth and the river species that many of our members enjoy catching.

## Devon Rd

Cropping of some of the larger bream with just the occasional carp stocking as and when required.

## Presidents

To be left much as it is apart from a restock of around 40-50 carp and 50-100 tench.
The cropping of all lakes will need to be carried out on a tri-annual basis and regular maintenance of the remaining crack willows and other trees will need to be booked into our annual work schedule By cropping out the bream and small roach from the Westminster field Lake and the Small lake at Sutton we believe that it will not take long before both of these lakes will produce a number of carp in excess of 40lb along with specimen fish of all species. The matches will also be improved by better match weights from both the big Lake and the Viaduct Lake. This will hopefully inspire some of our younger members to take up match and pleasure fishing.

This plan will take many years to implement and will be on going, but with careful management we feel that we will be able to supply the type of angling our members require.

